DOCUMENT RESUME

ED 055 404 EC 040 249

AUTHOR	Abeson, Alan; Blacklow, Julie, Ed.
TITLE	Environmental Design: New Relevance for Special Education.
INSTITUTION	Council for Exceptional Children, Arlington, Va.
SPONS AGENCY	Bureau of Education for the Handicapped (DHEW/OE), Washington, D.C.
PUB DATE	71
NOTE	124p.
AVAILABLE FROM	Council for Exceptional Children, Suite 900, 1411 South Jefferson Davis Highway, Arlington, Virginia 22202 ($6.75)
EDRS PRICE	MF-$0.65 HC-$6.58
DESCRIPTORS	*Architectural Programing; Building Design; Classroom Environment; Design Needs; *Educational Facilities; Educational Planning; *Environmental Research; *Exceptional Child Research; *Handicapped Children; National Surveys; Research Reviews (Publications); School Buildings

ABSTRACT

Educational facilities for handicapped children are examined in terms of environmental design planning and needs. The first of four sections reports basic findings of the project Physical Environment and Special Education: An Interdisciplinary Approach to Research, which appraised by questionnaires and site visits the present status of special education facilities in the United States. Presented are general findings and implications for design planning based on data gathered relating to student integration, community and parent involvement, the learning space, the educational program and activities, social adjustment, observation systems, transportation, and administrative planning. The second section focuses on planning mechanisms and strategies from the point of view of both architects and special educators. Some individual approaches to planning are presented and mechanics of involving people in the planning process are discussed. The third section contains some specific solutions to environmental problems, with accompanying illustrative drawings. The final section presents selected research findings related to physical and psychological effects of environmental manipulation, research needs, and methodologies which can be used to conduct further research in this area. (KW)

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The Council for
Exceptional Children

ED055404

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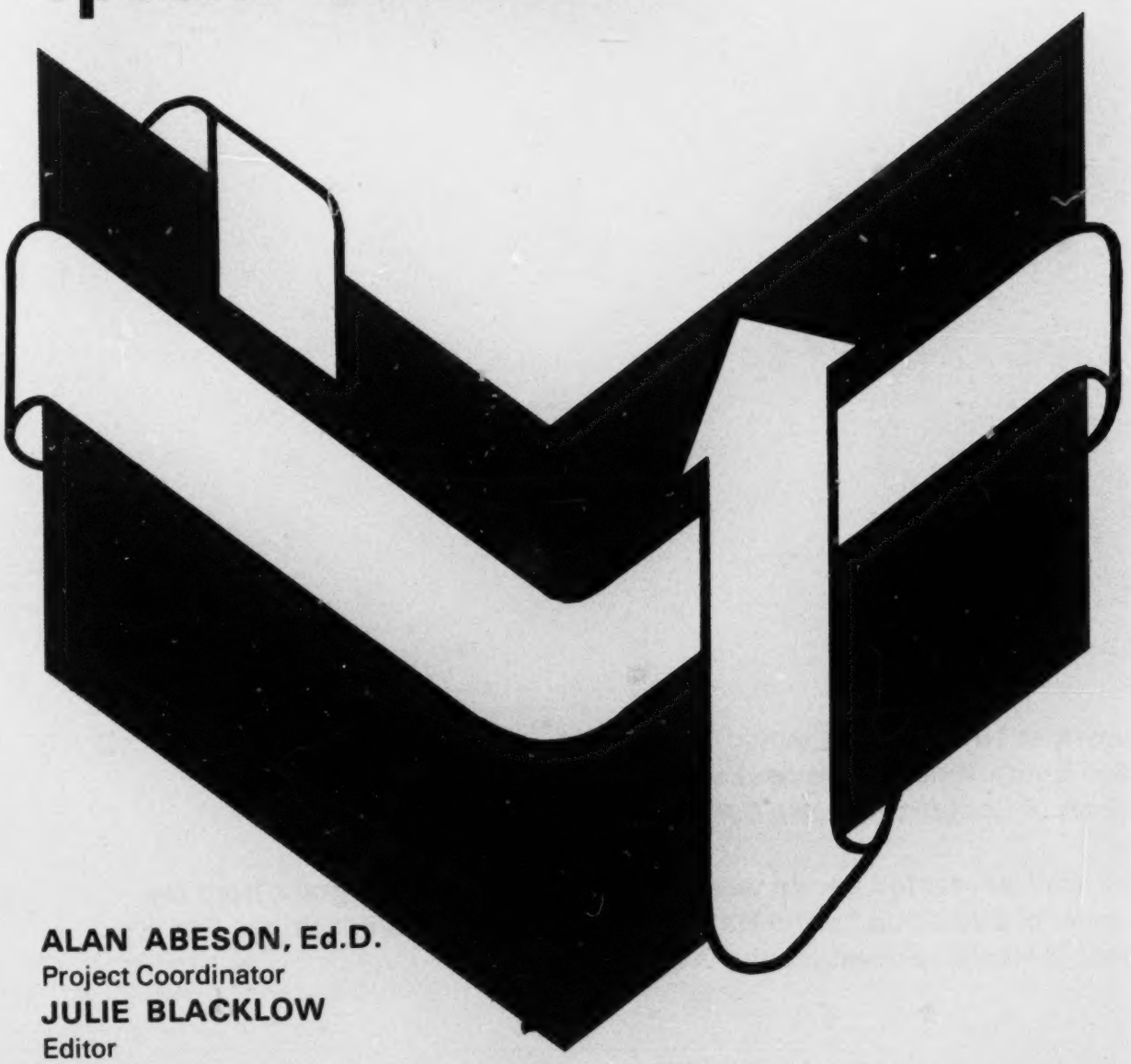

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ED062404

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1411 South Jefferson Davis Highway, Arlington, Virginia 22202
Library of Congress Catalog Card Number 73-175-033

The work presented herein was performed pursuant to a grant from the Bureau of Education for the Handicapped, US Office of Education, Department of Health, Education and Welfare.

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Stand back and look at your school; it's a pretty chilly place. It's ceramic, indestructible, antiseptic, reverberating, hard, glistening, slippery. That's the municipal response to the feeling that people are more evil than good, and that children naturally (although birds won't) destroy their own nests. If you can warm up some of these places, take the chill of the frost out of some of the places we gather together, then maybe more people will like to be there, in a more friendly setting, and more often.

Harold B. Gores
President, Educational
Facilities Laboratories,
New York City

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INTRODUCTION

The publication of this book represents the long and active interest of The Council for Exceptional Children in the development of efficient and effective educational facilities for the instruction of handicapped children. CEC's interest in this area was formalized initially by its sponsorship of a conference in September, 1965, on the design of educational facilities for the education of the handicapped. Following that conference a proposal to engage in research related to special education and physical environment was developed, submitted, and subsequently funded by the Bureau of Education for the Handicapped. That project, *Physical Environment and Special Education: An Interdisciplinary Approach to Research,* was conducted at CEC from June, 1967 through November, 1969. With the publication of this book, which reports much of the project's findings, the project is concluded. However, through the CEC Information Center, materials developed during the project as well as new items related to this area, will be made available to interested persons.

THE PROBLEM

Urban sociologists and others who have studied the patterns associated with the "settling in" of newly arrived groups into the city speak of the "principle of succession." This principle states that the newest group to arrive—regardless of ethnic origin, religious beliefs, or racial heritage—occupies the least valued and usually the least desirable environment. It is this same principle which has operated for some time in regard to educational facilities for the handicapped.

It is common knowledge that the education of handicapped children often occurs in abandoned schools, churches, barely modified basements, and renovated offices or custodial quarters. Gradually, as more and more handicapped children participate in education programs, improved facilities are being made available to them. However, in many cases no adaptation of the facilities in which they are housed is made to meet their special needs. In some schools however, special wings or other specified areas of regular buildings are planned for and used by the handicapped. And, often, in trying to meet the needs of the more severely handicapped, special buildings totally designed for occupancy by the handicapped have been constructed.

Although persons responsible for the planning, design, and implementation of these facilities have tried to improve their techniques, some problems remain. The demand for space is critical as indicated by estimates that 3½ million handicapped children are not as yet receiving any special services. Translating this to facility demands indicates that 2,358,000 student stations or 19 percent of the total demand for education facilities in the United States is needed for the handicapped. Another problem is related to role expectation: Frequently educators perceive themselves as designers—a job that should be filled by the architect. Yet a third is the problem of communication between architects and educators. The educator often is unable to express educational objectives in a manner that will be understood by the architect.

Today, the basic question facing these architects and educators who become involved with planning facilities for exceptional children is: are they going to duplicate what has already been done, or are they going to step forward and begin to design a physical environment that is based on educational and child-related variables? The role of the physical environment is not totally to serve a teacher, but rather to be available as a teaching tool or catalytic agent to enhance the entire education process. To what degree this does or can occur is not known, for the science of environmental psychology is in a primitive stage of development. The emerging sophistication in this field must lead to increased attention to the learning space as an experimental variable and its effect on the learning process.

Recognition of the many problems related to provision of space and its design led The Council for Exceptional Children to take an active part in determining ways of solving these problems. Consequently, the project *Physical Environment and Special Education: An Interdisciplinary Approach to Research* was an attempt to formulate a series of research-based statements to assist both special educators and architects in the design of appropriate environments for special education. Composed of an architect, a special educator, and an advisory panel representing the fields of architecture, special education, administration, research, and psychology, the project staff sought to accomplish the following objectives: To appraise the present status of special education facilities in the United States; and to identify and develop information that

would be useful to facility planners both in terms of problem identification and planning procedures.

It was an attempt to describe the fundamental elements for environmental change—change which may ultimately benefit all exceptional children.

THIS BOOK

During the operation of this project an extensive search of the literature was conducted relating to the planning and design of education facilities for handicapped children. The review of identified documents resulted in the publication of a report—*Selected Abstracts: Physical Environment and Special Education*—presently available from CEC. However, it was also learned as a result of the review that there is very little substantive information available to assist in the design of special education facilities. This book is intended to help meet this need.

In keeping with this purpose the book has been designed in a manner to permit use by a variety of persons. The first section includes a presentation of the basic findings of the project regarding the status of educational facilities for the handicapped. The data were obtained through the use of mailed research questionnaires and site visits conducted in various schools across the country. The hard data suggest various considerations that must be weighed during the planning of facilities for exceptional children. Also included in the section on findings are conclusions and recommendations suggesting needs for further action in this area.

The second major section of the book focuses on planning. During the operation of the project, the weaknesses of planning procedures in many districts became apparent. For example, architects often pointed out that they are rarely required to use their design talents and are most heavily involved in the generation of production drawings. At the same time, it became apparent that educators did not know what responsibilities they had as employers of architects. Since no research has been done on effective planning mechanisms and strategies regarding this area, it was decided by the project staff to hold a small seminar, involving architects and special educators, to develop statements about various segments of planning. In addition to the selected

consultants, the project staff also made recommendations. As a result the material presented reflects a variety of views about planning. It can safely be stated that no single approach is the "right one."

When the question of designing facilities for handicapped children was first raised during the project, the assumption was that new facilities were being considered. However, looking at the history of facilities for special education indicates that often these children are placed in housing that has been inherited from earlier and now departed groups. Consequently, there is often a need for renovation. The principles of design and planning needed for renovation are the same or similar to those needed for the design of new buildings. It is for this reason that the third section of the book, relating to specific environmental problems and solutions is included. The drawings were designed by an architect after a number of comprehensive discussions about specific design problems. The solutions to specific problems are somewhat abstract and were developed without regard to the constraints of financing, time, and individual necessity. Therefore, they must be considered only abstract ideas which may or may not work. They are included not only as possible answers, but to further stimulate thinking about environment.

One of the major findings of the project was that rarely does evaluation of special education facilities take place. In fact, this statement could probably be generalized to include all education facilities. In addition to the general paucity of information about the effects of facilities, there is little information available about research being conducted to determine the specific impact of environment on children. Thus it is the fourth and final section of this book which presents research findings and needs as well as methodologies that can be used to conduct further research in this area.

ACKNOWLEDGMENTS

Since the beginning of CEC's interest in this field, a large number of persons have helped to refine a very broad interest into an operational project. Various activities have included the development of specific methodology for the project's research, participation in the three regional dissemination conferences, and the selection of significant content for the project's final report.

Specific acknowledgment must go to William C. Geer, Executive Secretary of CEC, who fostered this project from inception to completion of this book. Paul Ackerman also deserves recognition for contributing to the development of the project proposal. During the active phase of the project, the advisory panel included Herbert Quay, Joe French, Herman Field, Ivan Garrison, and Ernie Willenberg. William Cruickshank served as the project's research consultant and made significant contributions to the design and operation of the project.

Bertram Berenson, architect-educator, who directed the project, should receive special acknowledgment. His creative conceptualization of the role that the physical environment can play in the education of handicapped children opened new vistas of thinking for all those involved.

Thanks must be given to the following school districts for permitting the project staff to conduct comprehensive site visits in their schools: Bassett Unified School District, Bassett, California; San Bernardino City Schools, San Bernardino, California; Duval County, Jacksonville, Florida; Centennial School District, Warminster, Pennsylvania; Tacoma Public Schools, Tacoma, Washington; Lake Washington Schools #414, Kirkland, Washington.

Tom Laging, architect and teacher at the University of Nebraska's School of Environmental Design, deserves special recognition for interpreting graphically some of the special needs of handicapped children. His drawings illustrate the third section of this book.

Finally, acknowledgment must be extended to the consultants who specifically prepared materials for this book. They include Frank Hewett, Charles Woodcock, Sidney Eisenshtat, Ralph Baird, Dick Veenstra, Cliff Drew, and Donald Blodgett, who contributed material for the second and fourth chapters of this book. Further, the work of Maurice Flagg who developed a draft of a portion of this book, and Deborah Peterson, who competently served as the project secretary must also be mentioned. Thanks, too, must be given to Chris Hayne for her assistance in the preparation of the final manuscript. Finally, the capable work of Grace Warfield in the entire bookmaking process must also be acknowledged.

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FINDINGS | RECOMMENDATIONS

status of the special education environment

PROCEDURE

To obtain data that would answer questions relating to the present status of special education facilities, two questionnaires were developed by the project staff—one for special education administrators and the other for teachers. The administrator questionnaire was designed primarily to determine the planning process and procedures applied to special education facilities, while the teacher instrument attempted to assess the manner in which the present facilities are used. The questionnaires were distributed by mailing packets of five (four teacher, one administrator) instruments to the administrator in each of the participating school districts. Each administrator was given directions to distribute the teacher forms to persons who represented as many different programs for exceptional children within the district as possible. Responses to the administrator form, however, were solicited on the basis of the single most recently constructed or renovated school in the system which served exceptional children. Out of a total of 495 questionnaires sent to administrators, 331 or 66.9 percent were returned. A return rate of 53.9 percent (1,079 out of 1,898 questionnaires) was realized in the teacher sample. The total return rate achieved was 57.4 percent or 1,410 questionnaires received from a total mailing of 2,475.

It is possible that the data reflect a bias having come from situations where there is an interest in environment and its relationship to the education of exceptional children. The 495 districts indicated a desire to participate.

The data from the returned and usable questionnaires were placed on punch cards for machine tabulation. Frequency counts of responses to questions were summarized and percentages based on the total number of responses to each item were computed. The combination of some questions which allowed multiple responses and the failure of respondents to answer some items resulted in some variance in the computed percentages. A number of questions were open ended and thus not summarized by the computer. These responses were hand tallied and classified.

It should be mentioned that the questionnaire data were also put to another use. The questionnaires were analyzed by criteria developed to isolate schools which evidenced effective planning. As the questionnaires were returned, the

responses were matched against the predetermined criteria. From this process, 17 potential locations for comprehensive site visits were chosen. These sites were subjected to further evaluation during one day visits by the project staff. Six sites were finally selected for intensive 3 day site visits by the project staff and a representative of the advisory panel. Documenting and evaluating the planning process that occurred and describing the facilities through interviews and photographs were the objectives of these visits.

All of the statistical data appear in the preliminary final project report, *Physical Environment and Special Education: An Interdisciplinary Approach to Research,* published in February, 1970 and available through the CEC Information Center. The categories used for analysis of the data are listed here along with some of the general findings and implications for planning. The numbers in parentheses after the percentages are the actual number of respondents.

PROJECT FINDINGS

INTEGRATION. There are a number of variables to consider when deciding where to locate facilities for special education. Among the most significant is the desired relationship between special class and regular class children. The decision about integration-segregation has significant implications for school planners. In all cases except those involving the educable and trainable mentally retarded, the responding administrators said that integration occurred in "all possible activities." Where specific integrated activities were listed, the most frequently reported were physical education, assemblies, music, lunch, and arts and crafts.

The physical environment may serve to greatly enhance or inhibit the frequency of integration or segregation regardless of which is desired. Obviously, the construction of a special education school on a site devoid of regular children will produce the ultimate in segregation. However, a similar effect may occur by assigning a specific space or set of spaces to exceptional children within a school which does include nonhandicapped and handicapped children. Special classes are often located in the basement, at the end of a wing, in relocatable facilities; or the exceptional students are separated from the regular children by program restrictions such as requiring special children to

eat in their own rooms, to enter or exit at a separate entrance, or to use the same entrance as normal children, but at a different time.

If integration of exceptional and normal children is to be a goal of the educational program, then the physical and psychological environments must be carefully planned to provide the necessary accommodations. To prepare for integration, planners must determine where and when integration should occur and which children and adults should be involved. For example, planners should consider that exceptional children must be able to go from one section of the building to another to interact with regular children. This might call for clearly marked symbols on all doors to assist retarded children in getting to the right place. Similarly, a textured strip in the floor or along the wall might help visually handicapped children progress through the building. If physically handicapped children are to participate in all school activities, as many architectural barriers as possible should be eliminated.

COMMUNITY AND PARENT INVOLVEMENT. In addition to serving children, the school also has a relationship with the parents of both normal and exceptional children and the surrounding community. Both historic and contemporary views of the school establish the school's responsibility for interpreting and implementing the nature of the school's activities and purposes to parents and the rest of the community. Since this activity and the way in which it is pursued have environmental implications, the questionnaire had several items dealing with this area.

Eighty-eight percent (255) of the sampled administrators indicated that their schools served as a total community resource. The most frequent activities occurring after school were community meetings, sports, youth activities, and special group use. A community's extensive use of public schools after normal school hours suggests many items that could be considered by environmental planners. Perhaps the first is the need for a careful and systematic inquiry into the after-school use patterns of existing facilities, such as the average size of group, frequency of group use, type of activity, necessary facilities and equipment, and storage requirements. Obtaining such in-

formation will contribute to the planner's understanding of the needed relationship between spaces.

Parents and other adults participate frequently in daytime special education programs; 49 percent (141) of the administrators reported the use of volunteers. Again, when planning, the specific task patterns of the volunteers need to be known in order to provide adequate operating space. Space for volunteers and/or parents should clearly reflect the purposes of having these persons in the school. If, for example, volunteers are to assist teachers in emergency situations, then means must be provided for teachers to contact these volunteers when necessary.

THE LEARNING SPACE. Perhaps the individual element which should receive the greatest amount of design attention is the learning space itself. It appears from the data collected through this project that, at present, the vast majority of special education programs use traditionally defined classrooms as opposed to the more recent open learning space. Throughout the field of education there is a growing awareness that the physical environment can enhance or inhibit the daily operation of the educational program. When facilities are created to be permanent, changes in educational programing are often prevented from occurring by inappropriate space. The net effect of this situation is "locking in" the type of program and activities currently used. To obtain information in this area, some questions were specifically designed to determine the relationship between the intended uses of the environment and its actual uses.

The existence of a gap between planned and actual use of the environment was verified by almost half of the sampled teachers. Additionally, slightly over one-fifth (20.4 percent—208) reported that some activities which occurred in their classrooms should not be permitted to occur there. In order of frequency, those mentioned include small group physical education, instructional activities, arts and crafts, and music. It becomes clear from this data that the special education classroom is a multi-use space and yet despite the changing nature of the children, program, requirements, and teacher, the environment remains virtually the same.

Other items in the survey were directed to the specific assets and deficiencies of the spaces currently being used for the education of exceptional children. Examination of these items, particularly those which included an opportunity for open ended comments, suggests that teachers were generally oblivious to the physical environment in which they operated. This lack of awareness can be described as general apathy of both a positive and negative nature about the environment. The response patterns suggest that teachers approach the space in which they are to work as predetermined and unalterable. Perhaps if teachers became more aware of the environment, they could better modify their own spaces and would contribute more when called upon to help plan effective facilities.

The sampled teachers were asked initially to indicate those "architectural aspects of your teaching space that you would consider especially helpful in carrying out the teaching program." Analysis of the wide variety of responses suggested that the elements mentioned fall into the following categories: space; furniture, equipment, and storage; and physical comfort. Persons who propose engaging in facility planning through systematic methods must consider these three dimensions in the design of learning spaces.

One question asked teachers to describe the environmental features which they considered especially helpful in conducting their teaching programs. Specific items mentioned were: direct access to the outdoors; drinking fountains in the teaching space; bathrooms adjacent to the classroom; sink in the classroom; pleasant view to the outside; private offices for teachers.

One critical and often controversial question which occurs when educational facilities are planned is the size of the classroom or learning space. Often, existing standards related to funding (state reimbursement formula) establish minimum, maximum, or actual size requirements. The questions, however, are whether or not a fixed standard is ever correct and, if a standard is fixed, for what group and over what period of time the standard should apply. It is possible that since special educators have worked in many different kinds and sizes of spaces they can react more meaningfully to this question than regular educators. Teachers of young trainable children operating in an old home have remarked on the intimacy of their space, the closeness of

the children, and the consequent possibility of controlling each one. The same teachers with similar children who have moved to a new school with standard size classrooms make statements about loss of control, increased discipline problems, and more noticeable teacher fatigue. The data revealed that between three and four of every ten sampled teachers (34.4 percent—350) are currently operating in space which they consider too small. On the other hand, 2.1 percent (21) of the sampled teachers reported that their space was too large. The elimination of present arbitrary standards dictating the size of learning spaces and the establishment of individually applied formulas weighing the many variables involving the child, teacher, and program are needed to yield a more usable educational environment.

The effectiveness of a space is dependent not only upon its size, but also upon its usability. Responses to items questioning usability reveal a need for flexible space, a space which can support the simultaneous or single operation of a variety of activities, groups, and equipment. The responding teacher sample indicated that through the use of relocatable walls, partitions, furniture, and equipment, attempts were made to provide for flexibility. The "ability to divide space into two or more spaces" through the use of such devices was reported by 25.9 percent (264) of the sampled teachers. Of this group only 15.6 percent (159) had relocatable walls. The remainder were required to use other equipment to achieve this same end. Almost 30 percent (301) of the responding teachers established special semipermanent activity areas in their classrooms which were used for arts and crafts, libraries, and resource and media centers. About a fifth of the teachers (19.4 percent—198) reported that small permanent spaces immediately adjacent to their classrooms were provided for special purposes.

The usability of a space is also directly related to the quality and quantity of the furniture and equipment that is available within it. Over a fifth (22.1 percent—225) of the teachers reported that the furniture available in their classrooms was inappropriate. There was a frequently stated request for homelike furniture. Again, about a fifth of the sampled teachers reported inadequate chalkboards (19.2 percent—195) and tackboards (20.3 percent—207). Frequent mention was made of the need for sinks, mirrors, display areas, internal communication systems, and additional electrical outlets.

It is well known that today's school planners are required to design a physical environment which will permit the greatest use of current and future technological-educational devices. The present approach to the utilization of this instructional equipment, as indicated in the questionnaire data, is that of purchasing highly portable equipment and providing central storage space for it.

Recognizing that this pattern is changing since this equipment is extensively used with individual groups of exceptional children, the questionnaire investigated what equipment was purchased and where it was stored. As indicated in the data, the only device permanently available in more than half (66.3 percent—675) of the reported classrooms is a record player. Permanent projection screens, headsets and receivers, tape recorders, and filmstrip projectors were available in about a quarter of the reported classrooms. The only instructional device available in less than approximately a fifth of the sampled schools was computer assisted instructional equipment. The data reveal a trend to store instructional equipment centrally and make it available on a teacher request basis.

While it is apparent that much of the instructional equipment is generally used by most of the sampled teachers at some time, other more specialized equipment is used for children with learning disabilities, the physically handicapped, and the visually handicapped and is stored in the classroom. A somewhat surprising finding was that teachers of hearing handicapped children reported that specialized equipment for these children is often found in central depositories rather than in classrooms.

To use equipment stored in a central storage area most effectively, the teacher must have fairly easy access to it. A question asking how much time was required for teachers to reach the room where audiovisual equipment was stored indicated that almost 60 percent (609) of them could get to that space in 2 minutes or less. Interestingly, 133 teachers (13.1 percent) of the sample required more than 5 minutes to reach the equipment.

Planners of facilities for special education must be aware of the needs for and uses of the vast array of instructional equipment now available. Use of this equipment requires, in addition to adequate electrical service and central stor-

age areas, efficient and effective classroom storage. When the storage capacity present in classrooms is inadequate, as was reported by 38 percent (387) of the teachers sampled, use of instructional materials is more difficult.

Frequently, cabinets, book shelves, and other storage units placed in classrooms are of uniform size, quite unlike the teaching materials used in special education classrooms. Too often storage units are too deep and/or too high to permit teachers rapid access to needed materials. Consequently, there is a need for storage capacity which accommodates materials and equipment of differing sizes and frequencies of use.

Also of importance are the provisions made for children's access to stored materials and equipment. If such access is desired, then the height, depth, and location of the units, as well as the types of closing or locking devices, should be considered. Educational objectives should affect the decisions in this area. If, for example, the development of independence is to be stressed, easy child access to the storage area can contribute to the realization of the objective.

Another storage problem frequently seen in special education programs, especially those for physically handicapped children, is related to the many types of mobility devices. In such programs, it is not uncommon for wheelchairs, crutches, standing tables, and walking frames to be used. Because of changing activity schedules there are times during the day when some of this equipment must be stored to insure the children's maximum mobility and safety. The most effective solution might be designing storage space specifically for the out-of-use equipment. Somewhere in the building there should be a large enough storage space for equipment not in use. Without such a space, unused furniture, left in classrooms or corridors, takes up valuable space and often produces serious safety hazards.

Teacher and child physical comfort, as indicated earlier, are elements of the environment considered especially important by teachers. Because classes for exceptional children are frequently located in renovated or reconditioned spaces, this need is often overlooked. Because of their handicaps, exceptional children may create special comfort demands. Physically handicapped or hyperactive children may, because of frequent or uncontrollable physical movements, need

generally cooler temperatures. Visually handicapped children always require adequate lighting, but under some conditions may also need specialized illumination. Hearing handicapped children always require the best acoustical conditions possible.

A deficiency most frequently reported by the sampled teachers was an inadequate cooling system (27.5 percent—280). These teachers mentioned that the absence of adequate cooling directly affected the functioning of large group and physical activities as well as individual study and concentration. Fewer teachers reported heating system inadequacies (17.9 percent—182), but those who did indicated that the primary activities adversely affected were study and concentration.

More than four out of every ten teachers (43.5 percent—433) responding to the questionnaire indicated that their teaching spaces were not free from extraneous noises during the school day. The types of noise reported seemed to emanate from two distinct areas. First were those noises generated in and on the school site: in order of frequency, the playground, the corridors, and other classrooms, including the gymnasium and cafeteria. The second group of noises were those from beyond the boundaries of the school. These noises, in order of mentioned frequency, were street traffic, industrial noise, trains and airplanes, and construction. Major activities affected by the noise included study and concentration, oral communication, large group music, and quiet activities.

With increasing frequency, attempts are being made to control the acoustic environment through the use of tile, carpeting, curtains, and other devices. Of these measures, acoustically tiled walls were most often available as reported by 38 percent of the teachers sampled. Almost 30 percent (303) of the teachers indicated that carpeting is being used in their schools.

EDUCATIONAL PROGRAM. A section of the questionnaire was devoted to obtaining information about specific types of activities occurring in most programs for handicapped children. Over half of the responding teachers (59.1 percent—602) reported grouping their students for instruction in at least one academic area. That practice is interesting in view of the fact that

only 12.4 percent of the teachers were located in rooms originally designed to promote grouping. Almost half (48.8 percent—497) of the sampled teachers also indicated that when they devised grouping schedules, more than one group worked at a time. Such instructional practice suggests that some thought should be given to enabling individual groups to work as privately as possible without visual or auditory disturbances from other groups through the use of easily moved barriers.

Many teachers, ranging from 37.9 percent (386) in social studies to 74.8 percent (761) in arithmetic, work with their children on a one-to-one basis. The use of this technique—plus the indication that an average of about a fifth (19.9 percent—196) of the respondents isolated specific areas of the room for independent work, for creative efforts by the children, for child isolation for rest, discipline, or other purposes—underscores the need for the environment to allow the creation of small group or individual activity spaces. Again, the frequency of each of these instructional arrangements, the numbers of persons involved, and the need for rapid movement to and from spaces is information which should be obtained prior to the development of a building design.

From the data received through this survey, it can be reported that approximately 7 or 8 of every 10 exceptional children were exposed to instruction in social studies, arithmetic, language, reading, and science. In most instances, these subjects were taught within the confines of a self contained classroom.

PHYSICAL EDUCATION. Slightly over half (54 percent—554) of the teachers in this sample gave instruction and held physical education activities in spaces specifically designed for this purpose. However, a gymnasium or another space used exclusively for physical education was available in only 41.6 percent (423) of the responding cases.

Attempts were also made to obtain specific information about the nature of the physical education program. Approximately a quarter of the responding teachers worked in school plants which included facilities for swimming. Despite the availability or absence of spaces for physical education activities,

52 percent (529) of the responding teachers indicated that they conducted some physical education activity in their classroom spaces. The teachers were asked to list the physical education activities conducted in their classrooms. The most frequently conducted activity was related to developing or maintaining the physical fitness of the children. Games, coordination activities, sensory-motor training, and dance were the next types most frequently mentioned while special activities and leisure activities were least often mentioned. Almost the same order and breakdown occurred when the teachers described the total range of activities in the entire physical education program.

MUSIC. Almost half (47.2 percent—481) of the sampled teachers indicated that they do not teach music in their classrooms. Of the teachers who did, 15 percent (153) used a specific place for this instruction because of the location of pianos and other musical equipment. Fifty-three percent (545) of the sampled teachers grouped the children when teaching music, while 2.4 percent (24) worked with the children individually during music instruction. Twenty-one percent (214) of the teachers employed in buildings with music rooms reported that that was where music activities occurred.

ART. In 38.7 percent (394) of the sample, a school arts and crafts room was available for use by exceptional children. However, 64.2 percent (654) of the responding teachers reported that they conducted instruction in this area within the confines of their own classroom. Of that group 17.3 percent (176) repeatedly utilized a specific portion of the classroom for these activities, generally for reasons of convenience or the location of necessary equipment. Storage of materials for arts and crafts activities was reported a difficult problem by 41.4 percent (421) of the sample population.

DRAMATIC ARTS. Auditoriums, multipurpose rooms, lunchrooms, playrooms, and an assortment of other spaces served as locations for dramatic arts activities. About 12 percent (118) of the sampled teachers worked in schools with rooms especially designed for the dramatic arts. Similarly, a small number of classrooms (8.2 percent—83) were supplied with special equipment or furnishings related to conducting dramatic arts activities.

SOCIAL ADJUSTMENT. Approximately one-third of the sampled teachers had private space or a similar area available in their classrooms. These were used for a variety of purposes, including, in order of frequency, teacher determined isolation, child determined isolation, discipline, rest, instruction, observation, and storage. Of the responding teachers located in classrooms without such spaces, 24.2 percent (246) of the sample indicated that similarly used spaces were available elsewhere in the building. Only about a fifth (20.2 percent—206) of the teachers were able to observe children occupying the private spaces.

OBSERVATION SYSTEMS. With the heavy emphasis that is now being placed on the educational and behavioral diagnosis of exceptional children, there is an awareness that more opportunities to observe the children are needed. Teachers were asked, therefore, what kinds of observation systems are now being used and how often these systems are used. Fewer than four of every ten special education classrooms had observation facilities. In approximately half of the programs utilizing closed circuit television systems, a formal relationship was maintained with university teacher preparation programs.

While no hard data were obtained about the adequacy or inadequacy of any of these systems, the project site visits yielded some observations. One-way vision windows were frequently placed in the wall between the corridor and classroom. Often when this situation existed, no equipment was provided for hearing what was occurring in the classroom and no seating was available for extended observation. When specific observation rooms were provided, the audio equipment was frequently broken. In addition, the spaces were located between two classrooms and were designed to accommodate only three or four persons. Often, resourceful teachers with storage problems had converted these infrequently used observation rooms into storage annexes. The presence of stored materials made access to the observation area difficult and also led to the interruption of observation sessions when children, aides, or the teacher entered to obtain stored items.

To minimize interruptions in observation rooms, a signal lamp which lights when the room is in use could be located above the door. Depending upon the feelings of the teachers and administrators in a particular school, some thought should be given to providing a signaling device to let the classroom teacher know when he is being viewed. Window shades could be mounted over the observation room's window to give the teacher the option of allowing no observation at certain times.

Two common approaches, the use of one-way windows in classroom doors and the provision of an observation area which can only be entered from within the classroom, have proven ineffective. The first approach allows only one viewer at a time and offers no audio capabilities. In addition, corridor traffic is a constant distraction. When the observer can only enter the viewing space through the classroom, the class is informed that they are to be watched, and many of the purposes of observation are defeated.

TRANSPORTATION. One area which is often given insufficient attention is provision of adequate facilities and equipment for the arrival and departure of the students. It was learned from the questionnaires directed to the administrators that 72.9 percent (210) of these administrators' programs involved providing transportation for some exceptional children. Additionally, slightly under half (46.2 percent—133) of the responding administrators indicated that the transportation system used for exceptional children was different from that provided for children enrolled in the regular program.

Solving the problems associated with this area of school facilities involves consideration of many elements. At the head of the list is the circulation pattern of children and vehicles. In many schools, a large number of vehicles are employed to carry children to and from school. If all these vehicles arrived at one time a serious safety hazard could be created if some children were unloaded on the vehicular area while other vehicles, which had discharged children, were moving to their next destination. The establishment of an arrival and departure schedule, which designates circular drive areas or one-way drive patterns restricting unloading to one area, might

help solve the chaotic situation previously described. Planners should also recognize that a wide variety of vehicles are used to transport exceptional children to school. Station wagons, taxis, and private autos, in addition to school buses of various sizes, are used. This situation requires that the unloading and loading areas be suitable for these vehicles.

PLANNING (ADMINISTRATOR DATA). Throughout this project, investigation of the planning process used to develop special education facilities was emphasized. As a result, considerable attention was directed to this area on the questionnaires sent to administrators. The responding administrators answered the questions in terms of their most recent planning.

The first series of questions were concerned with identifying those persons involved in the planning process and the sequential manner in which this involvement occurred. It has been suggested that to obtain the best building product both the chief administrator and the architect should be hired as early as possible in the planning stage. The data indicate that this situation occurred in fewer than half of the sampled situations. In 130 (45.1 percent) of the sampled situations, the administrator of the proposed building was assigned prior to the determination of the requirements of the building. Almost all of those persons so assigned were consulted during the preparation of the building requirements. In 42.7 percent (123) of the sample, it was indicated that architects had been assigned prior to the determination of the program requirements.

The project staff hypothesized that persons representing various fields would be involved in school planning through assignment to formal committees. The data revealed, however, that if planning committees were formed, they were most frequently informal with no fixed meeting schedules, data collection devices, or reporting mechanisms. Slightly over 28 percent (81) of the administrators sampled utilized formal committees, while 43.1 percent (124) did not create them and 26.7 percent (77) did not know whether such committees were or were not used. That many types of persons were involved is indicated in the following table:

Persons Involved in Special Education Facility Planning

Discipline	*Percent of Admin. Responding*	*Number of Admin. Responding*
Architect	66.7	192
Teachers	48.3	139
Educational evaluation group	20.8	60
Physicians or nurses	17.4	50
Parents	14.6	42
Citizen committee	13.2	38
Materials specialist	10.4	30

The following list indicates persons consulted in the development of special education facility plans:

Persons Consulted for Planning

Persons Consulted	*Percent of Admin. Responding*	*Number of Admin. Responding*
Administrator responsible for planning	18.8	54
Director of special education	14.9	43
Building committee	14.9	43
Superintendent of schools	13.9	40
Teachers	13.9	40
Board of education	11.1	32
Special education administrative staff	10.8	31

The data further indicated that in 31.3 percent (90) of the sample, the special education teaching staff was given periodic opportunities to meet with the architect and present their points of view about the facility needs.

Questions about the types of investigations conducted prior to the planning of the building were also asked. The data received are presented below:

Preliminary Investigations Prior to Planning

Type of Preliminary Investigation	*Percent of Admin. Responding*	*Number of Admin. Responding*
Population analysis	50.3	145
Topological analysis	44.1	127
Zoning analysis	42.4	122
Transportation analysis	41.7	120
Economic analysis	35.4	102
Climatological analysis	19.8	57

Additional items asked about what sources of information were tapped to obtain information relative to the location and planning of the building. A variety of agencies considered to possess such information were listed and the responses are listed below:

Sources of Information for Special Education Facility Planning

City or County Agencies	*Percent of Admin. Responding*	*Number of Admin. Responding*
Health agency	29.2	84
Planning department	22.2	64
Welfare department	13.5	39
Utilities commission	10.0	29
Department of sanitation	9.0	26
Department of roads and highways	8.0	23
Urban renewal or redevelopment agency	7.3	21
Chamber of commerce	5.9	17
Transit authority	4.2	12
Housing authority	3.8	11

Questions were also asked about evaluation of the completed building. Approximately a quarter of the sample (25.7 percent—74) responded that either teachers or administrators were asked to make an evaluation of the

building after it was completed. It appears from the data that where such evaluations occurred, they were informal. The persons preparing the evaluation devices or procedures varied from the building consultant to the board of education. It appears that districts engaged in evaluation of facilities did so to obtain additional information for planning other buildings. Of the sample, 26.4 percent (76), or about the same number who conducted such evaluations, indicated that they made use of evaluative material in continued facility planning.

CONCLUSIONS AND RECOMMENDATIONS

With the growth of educational services being provided to handicapped children, there is a corresponding demand for adequate physical facilities to house these programs. At present, and based on the findings of the project, it is clear that the majority of facilities being used for special education were not originally planned for that purpose. Consequently, the programs within those facilities operate in spite of the environment rather than in response to it. Such a situation in older schools is understandable, but a similar situation in many schools currently being constructed for handicapped children is not. Because of these recurring failures, the authors wish to present a series of recommendations for action in the areas of training, research, and government.

TRAINING. During the project, numerous visits and conversations occured with teachers regarding the physical environments in which they worked. It became apparent that the majority of these teachers felt that the design and furnishings of their working spaces were predetermined and totally out of their hands. This fact is not entirely accurate, but has immediate implications for the training of teachers.

First, minor modifications in the teacher's own working space can markedly improve the environment and ultimately the program. Excessively reverberating sound due to many hard surfaces can be reduced by the addition of curtains, drapes, or strips of burlap placed around the room. The addition of a throw rug can create the space for quiet activities such as storytelling, creative dramatics, and counseling. To make maximum use of the environment, teachers and aides should be sensitized to the concept of environ-

ment as a definite factor in enhancing the operation of the program. Such sensitization is required more than ever today, for the trend in the design of educational facilities is toward open space and undefined areas.

Secondly, in the past, as indicated by the data collected during this project, teachers have often been denied the opportunity to participate in the planning of the school buildings in which they work. This situation was documented by the site visits to schools where insufficient storage, single sized furniture, and divider walls that were somehow never used were in evidence. Numerous other examples of the lack of relationship between schools and teachers' programs can be cited, but the point is that teachers must become more involved in the facility planning process to develop better schools.

Usually when school buildings are completed, the architect disappears from the scene and vague, subjective staff comments about the building provide the only evaluation. Since no school building is perfect and many have excellent features which could be duplicated in new construction, there is a need for staff evaluation of school buildings. Again, training educational practitioners to be aware of what the environment is and what it could be is fundamental to effective evaluation.

All of the above comments are applicable to the training of educational administrators as well. Obviously, the leaders of the planning process must recognize the potential of the environment. Further, they must understand what is involved in developing plans for a school building, particularly with regard to the involvement of the community, local staff, and the architect. It is required that the administrator be aware of what the architect's responsibilities are in the planning and design of the building. Too often special educators who have had very little experience in the design of facilities do not expect enough from architects and, as a result, develop and accept ineffective buildings. Since the architect and the educator do not speak the same language and often have different motivations, the educators must inform the architect about the demands which are going to be placed on the structure. The demands must be stated explicitly — point by point, area by area, purpose by purpose. The educator must make the deci-

sions which will affect the nature of the building being designed. If the educator fails to do this, then the architect makes educational decisions.

Educational administrators need to be taught how to communicate with architects. If the architect did nothing but design special education buildings, then he alone would be most competent to make all the environmental decisions. However, architects work one week on a bank, another week on a laundromat, another week on a school. Therefore, educators must state their requirements and rule on the decisions.

RESEARCH. As a result of the project's activities, three areas for research efforts can be suggested. The first two, evaluating facility planning and measuring the effective use of the environment, are of immediate practical concern while the third, assessing the relationship between man and the physical environment is somewhat esoteric. The only reasons that the last area does not yet have practical application are that the body of knowledge currently available is limited and that there are methodological difficulties. As more research is done in this area and the results are translated into the practical domain, better facilities will be developed.

Of more immediate benefit to special educators would be an evaluation of the ways special education facilities are used. Administrators and teachers often begin planning an environment with little idea of how space is used. For example, how often what number of children come together with how many adults in what spaces are questions which need to be asked during planning. What types of storage compartments are most used or what furniture is most adaptable to the many needs of handicapped children are some others. The answers to these and many other questions can be used by the planners to develop buildings where space is utilized most effectively. Planners should use the method to develop specific elements in a specific building rather than to produce comprehensive plans for all special education facilities.

GOVERNMENT. As the demand for special education facilities increases, so does the demand for funds to support such efforts. The inability of local school districts to finance capital improvements is a problem which need not be re-

stated here. State authorities, therefore, will have a larger part in funding such buildings. Unfortunately, there is as yet insufficient state money available for this purpose. Perhaps the federal government has a role to play in providing some of this financial support, particularly for the development of model programs in modern facilities.

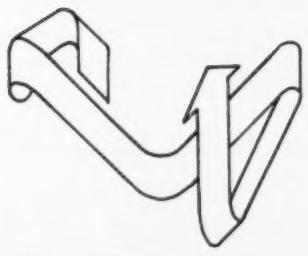
It is acknowledged that when funds are granted by state or federal authorities, the problem of concomitant restrictions is present. Unfortunately these restrictions often prevent the facility design from effectively meeting the program goals of the local agency. This is particularly true regarding state policies concerning specific numbers of children in certain spaces and arbitrary square feet formulas. These codes limit the designer's ability in developing a new and possibly more effective environment.

2

planning

PROCESS

PEOPLE



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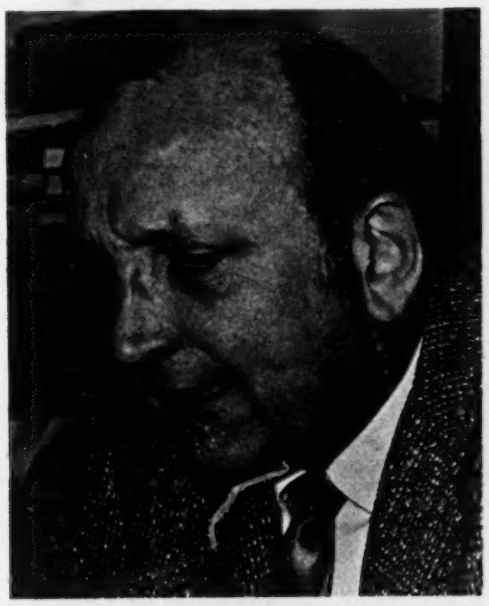

INTRODUCTION

This chapter is a conglomerate of ideas from 10 individuals who represent the professions of architecture and special education. All have an interest in special education facilities. A number of individual approaches to planning are indicated and in some cases, the mechanics of involving people in the planning process are discussed. Because the information is presented as stated by these persons, there may be concepts and points which appear to be in conflict. These were intentional. As yet, there is no one way to plan special education facilities.

AN APPROACH TO PLANNING

Education is largely an interpersonal enterprise. The teacher teaches, the child interacts; the peer group teaches, the child interacts. But teaching and interaction do not occur in a vacuum. There is a physical structure called a school to which all children come and which plays a part in determining the effectiveness, efficiency, and scope of what is taught and what is learned. While the interpersonal and interactional aspects of the teaching-learning process are primary, far too little attention has been paid to the physical setting in which it occurs. If this is true for normal children in regular classrooms, it is even more true for exceptional children.

These children—all children—learn because they are accurate and thorough explorers of their physical environment. They look, listen, touch, and taste in this process, and engage in a multitude of motor activities. Limitation due to sensory-motor deficits will affect the range and efficiency of a child's exploratory efforts as will perceptual inadequacy and emotional problems such as fearfulness, withdrawal, and destructiveness. As the child explores his physical environment he acquires knowledge about it and develops skill in interacting with it. Exceptional children vary in terms of their range of experience in the environment and their capacity and functioning in relation to it. These strengths and weaknesses need to be considered in planning any special education program.

Teaching children who are handicapped in sensory, motor, intellectual, and behavioral areas demands something extra from the teacher. Likewise, providing an optimal physical environment in which such teaching may take place

demands something extra of those who plan, design, and execute school facilities. While the teacher cannot alter basic capacities for vision, hearing, motor behavior, and intelligence, she can control aspects of the child's experience, provide opportunities for learning, and enhance functioning in many respects.

The special educator and the architect must be concerned with the child's competence and attitude. Competence is a composite characteristic resulting from innate capacity, previous experience and opportunity to learn, and present functioning level. Attitude is also a result of experience. Exceptional children, particularly the emotionally disturbed who have been frustrated and rejected in school, often become negatively conditioned or oriented toward school and learning. Learning becomes negative when the experience of school is repeatedly paired with failure, criticism, fear, and anxiety. In attempting to change a child's negative attitude toward school and learning, it is useful to create as unique a learning environment as possible. In this environment the child's previous attitude and associations with school just don't fit. . . .

Some of the following questions might be useful in the planning stages. The questions are asked within the framework of preacademic, exploratory, social, and academic categories.*

PREACADEMIC

How can we get exceptional children to increase their attention to learning tasks? In this regard the following questions arise:

—What is the relationship between wall color, presence of display boards, chalkboards, materials stored out in the open on tables, and the attention of various exceptional children?

—Are study carrels conducive to attention and control of distraction or do they foster isolation and daydreaming?

—Would closed study "offices" in which both visual and auditory stimuli are

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* For additional information about these categories see Hewett, Frank E., *The Educationally Disturbed Child in the Classroom,* Boston: Allyn and Bacon, 1968.

screened out facilitate attention or are problems apt to arise with supervision?

—Should classroom windows be opaque or excluded altogether, or should the room open out through a wall of glass to a garden patio area?
—Do carpets reduce noise level so that attention is fostered?
—Will movable walls make "instant" class size alteration possible so that small groups may be set up away from the larger class and thus improve attention?
—Should activity centers and materials be hidden from view to reduce distraction?
—Will separation of children by means of individual work tables lessen distractibility and disruption?
—Should student storage of books and materials be centralized (e.g. tote bins) or kept at individual desks? Or should all materials be kept on the desk with students assigned to keep them neat and orderly as part of the learning experience? Or will this be distracting?
—Should the teacher arrange the room so that her visibility is maximized during lessons and so that she is in close proximity to all students at all times?

How can we facilitate motor and verbal responding at the preacademic level? The following questions arise:
—Will teaching machines and/or tape recorders encourage responding with resistant students who dislike written work or oral class participation? Should these be built within the room or housed in a separate area?
—Will individual pupil work stations monitored by a central switchboard at the teacher's desk and use of headphones and recorded lessons aid in getting pupils to respond?
—Will use of slide projector presentation encourage participation by students, and where can projector and screen be located for easy access? Are individual slide projectors or 8 mm film loop projectors useful? Where should they be placed and stored?
—How can the room be arranged so that in-room traffic creates minimum distraction? (pencil sharpeners, drinking fountains, toilet facilities, class supply storage)

—Where can braille and language development materials be stored?

What about maintaining order and routine in the classroom?
—What type of visual bulletin boards can be installed for presentation of classroom schedules?
—Is a "time out" room or area useful to allow disruptive students a "cooling off" period? Should this be outside the classroom?

What options for controlling disruptive behavior can be provided by means of facilities?
—Should cupboards be locked to control student access or should materials be freely displayed?
—Should the teacher forego an individual desk and maintain a "roving relationship" to students or should a well defined teacher desk area be established with students called up to work in it?
—Do large open classrooms foster more acting out behavior than small, screened off areas? Can a room be so flexible that the teacher can create a full range of instructional settings—teacher-class, teacher-small group, child independent in booth, teacher-child tutorial?
—What type of desk surfaces, floor coverings, and wall coverings discourage destructiveness or defacing?
—Should desks and chairs be bolted to the floor?
—What acoustical treatments will enable children to hold group discussions without distracting others?
—Should drinking fountains and toilets adjoin the classroom or be in the halls?

EXPLORATORY
In providing opportunities for accurate and thorough exploration of the environment the following should be considered:
—What about housing animals, fish tanks, and science apparatus in the room? Is a ventilation hood a good idea to remove odors and handle paint fumes? What about storage space for equipment?
—How should floor coverings differ in exploratory areas where spillage of water, paint, and other liquids may be inevitable?

—Should space be provided for gross locomotor activities (e.g. ladder climbing, rail walking, trampoline jumping, tunnel crawling)?
—How about construction areas for woodworking? What about safety factors?
—Should large boxes and blocks be provided for creative play?
—What about kitchen and home living facilities for cooking, ironing, sewing, bedmaking, toilet training, cleaning, vacuuming, and eating? Are these best placed in a separate room or included in part of the classroom?
—How will floor and wall textures, color, and spatial arrangements contribute to the child's knowledge of the world around him and aid him in moving through the classroom environment?
—What playground equipment will foster interesting and creative play? Is this best placed away from or in close proximity to the classroom? Can activities be provided to allow the child to "let off steam" (e.g. punching bag, swings, rope jumping, running, turning somersaults) and not create problems of teacher supervision?
—Should a quiet rest area with a cot be in the classroom if a child is overly tired?
—If high interest activities (e.g. record player, slot car racing, model building) are used as reinforcers when the child completes a certain number of academic tasks, should these be in the room or in a separate area? What about supervision?

SOCIAL

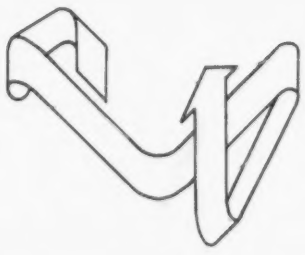
How can the physical environment support improved interaction among students?

—What about the seating arrangement? Should desks be shared or separated?
—How can communication areas be set up so two or more children can share a listening post, a game table, an art or science activity?
—Where can group discussion be held? How can seating arrangement facilitate verbal participation and cooperation?

ACADEMIC

Much of the material presented earlier bears on teaching academic skills. In addition:

—Where can visual instruction of groups be done best? What about chalkboard colors, teaching aids?
—Where should books be stored? Can attractive library areas be set up to encourage reading? Should a book shelf be set up by the door with pocket books the child can borrow as he learns to read?
—How should academic work be displayed in the room? Should there be display tables, showcases, or bulletin boards for student work?



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AN APPROACH TO PLANNING

The physical environment of a school, where pupils find themselves through no choice of their own, is a most critical area in need of review, modification, and, in some cases, total change. What is needed is a reexamination of the architecture of the school day—or in fact the school year. There is a decreasing need for continuing with the same kind of time structure over a 12 year period. The concept of a youngster attending school from 8:30 Monday until 3:30 Friday afternoon with a large amount of homework needs to be questioned. This, of course, implies a change of program. But it also calls into question architectural permanence as a detriment to the total structure of educational programing for the handicapped. Or stated another way—is not architectural mobility becoming more and more the necessary attribute to the nature and process of successful educational programing which will account for both the housing and learning needs of children over a period of years?

Mobility—flexibility—of program and structure is necessary if one takes into account and plans for both human processes and program dimensions such as population shifts; temporary mobility; increasingly surfacing feelings of anger; the predetermination of programs for pupils in the absence of pupil and parent participation; and the cyclical economics of a city, county, or region. All of these factors have a direct influence upon the capabilities as well as the limitations of educational programs.

Modifications for elementary and secondary school plans—even those which represent the most current and modern planning—must take into account a major direction today in the field of special education to include rather than to exclude handicapped pupils. There needs to be a closer relationship between pupils, teachers, and administrative staffs. But on many fronts a dichotomy continues to widen. Decisions being made which affect the K-12 facilities and environment must, however, relate directly to the physical and educational environments for handicapped pupils.

Those people making decisions relative to physical facilities for handicapped children must have a direct input into the central structure of their system. A particularly successful way of achieving this kind of internal communica-

tion is to demonstrate that the kind of creative planning and programing which maximizes the educational process for special education pupils has a direct relationship toward improving educational processes for *all* pupils.

If it is reasonable to assume that a facility should represent, at the broadest level, what it may be possible for a child to become, then it is clear that the facility has to be viewed as a "process" with its own dynamic, alive, and changeable characteristics. It is reasonable to assume further that since children, and in particular handicapped children, similarly have these changeable characteristics, then the human qualities may either be enhanced or limited as a result of the physical environment where they spend approximately 1,000 hours each year. Not only is facility development a process, but the concept of the facility must be a basic philosophical concept held in the minds of those involved in the planning stages.

The question must be asked if it is feasible to spend large sums of money on permanent facilities which by their very nature symbolize values and philosophies in direct conflict with the feelings of the people whom these facilities are supposed to serve and to benefit? The value of architectural units, of physical facilities, which can be more closely associated with a youngster's neighborhood, his home, and his immediate peer group is apparent.

It is generally true that it is much easier to talk about "hardware"—instructional materials, furniture, equipment—than it is to discuss the processes of learning. The leadership charged with the responsibility for coordinating planning of a new facility will have to reorient from time to time the groups' thinking toward learning, instruction, and curriculum. Of the many committee meetings that were held in our own school district in the past 2 years in planning for the development of a new facility for trainable children, this probably was one of the most difficult tasks and the one which became the most frustrating—to get the group oriented toward the processes of what is to occur in the child's mind and hence in

the teacher's instructional field. For after all, the ultimate purpose of education should be to "liberate the child's mind."*

THE PLANNERS

As a beginning step in the process of facility development, it is important to emphasize the necessity of involving people in the planning process who represent a variety of interest and responsibility levels. In the past, central administrative personnel within school systems have frequently been hesitant to involve teaching faculties, representative parent groups, and other neighborhood and community leadership personnel in this process. Hopefully, the trend is toward more comprehensive involvement of these levels of people in the planning process. The importance of including teachers, assistants, aides—in fact all levels of paraprofessional personnel who will be relating to instructional programs in the planning process—cannot be stressed enough.

The group of people who might have the most informative and productive things to say about a school's physical structure and environment are the pupils themselves. It might be most worthwhile to sample an adult or school age population of the deaf, the blind, the physically handicapped, or mentally retarded to seek their opinions, evaluations, and recommendations for changes in the physical environment.

One of the major concerns of urban minorities is that they feel they have little opportunity for input, for recognition of their needs, or of their rights. In reality their feeling is that they are not viewed with any substantial degree of sincerity—as having significant, helpful, or meaningful input into the environment in which they live. Therefore the planning process should include segments of all the populations served by the facility. It is also desirable that student leadership itself be permitted to guide and develop student committee meetings around the topic of physical environment and educational programing.

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* Matthew J. Trippe, University of Michigan, informal conversation.

Congruently, it seems reasonable to suggest that parents be allowed to develop group thinking and contribute recommendations. It is clear that a common thread of coordination has to function through all of the levels of the planning process. From the standpoint of final responsibility, the coordination has to stem from sources within the school system itself.

The process of facility development is contingent upon an almost infinite variety of factors. Within the framework of special facilities for handicapped youngsters, one of the most crucial of these factors is the very limited knowledge existing about the process of achieving goals and objectives for populations of handicapped children. Educators have difficulty in defining specific goals and objectives to serve as a frame of reference for physical and architectural aspects. The reason is that few planning bodies or groups are able to look beyond the initial completion stage of the facility to the point where the program actually becomes operational—in other words, the architecture of implementation.

The internal instructional and curriculum relationships exhibit barriers to the extent that there may be little constructive contact between the two pupil populations—regular and special education students—and the teaching faculties. If in the planning process a design for the physical architecture could decrease the psychological and attitudinal architectural barriers, an extremely important and positive step will have been accomplished. One of the points that this kind of problem brings to mind is the importance of involving several different levels of people in the planning process—all of them having a chance to meet with the architectural staff prior to designing any given facility. It is probably rare that an educational central office staff has made it possible for an architect to sit down with groups of pupils and teachers.

In order to achieve maximum results, it is important to take into account the consumer and his inherent needs to be involved, to take into account a time sequence or time calendar which would allow for the innumerable problems and solution-designed questions which will have to be answered. Depending upon the size of the system developing the facility, there will be a greater (or lesser) number of bases to be touched—including divisions or departments of instruction and curriculum, pupil personnel services,

educational research and evaluation, school-community relations, long range planning, federally funded or categorically aided programs, a principal's group, a teacher's group—all of these directly related to the school system itself. In addition, representing various degrees of involvement, there will be the State Department of Public Instruction, numerous community and peer groups, such as local associations representing various handicapped groups, vocational rehabilitation, the health department and its various divisions of child health services including mental health, and nursing and pediatric services. It may also be necessary to have a number of consultative sessions with other government agencies. The process of facility planning and development will encompass a majority of these areas. Complete and total agreement cannot be expected and should not be anticipated. Compromises, thinking, "calling time out," specific task descriptions, and roles to be performed are but a part of numerous occurrences to be expected.

The overall committee representation should reflect a balance of interests; it should reflect the power structure of the community; it should reflect innovative and creative elements of the educational and parent communities. It is clear then that the leadership itself must reflect sensitivity and awareness as well as the psychological and internal security to deal with multidimensional human variables. Educators, as a group, are not necessarily capable of demonstrating this kind of leadership, though these attributes are not always clearly defined and sought when systems look for leadership personnel.

A number of problems exist in the demanding job of steering, guiding, and coordinating such a complicated task as posed by the facility development team. The leader (or leaders) must first understand and know the dynamics of his own personality and his need structure. There is often hesitancy on the part of a facilities planning staff to spend more than a minimum amount of time with the instructional staff. It is not uncommon for staff members from instruction and curriculum to be included toward the end of the planning phase when the blueprints have already been developed. Frequently the school principal is involved to a somewhat greater extent, although his main function may be that of reviewing office space, and space

for his administrative staff, rather than being asked about the total school instructional program, what distinctive features it should contain, and about the interrelatedness of the total instructional program.

The community should participate in the planning process itself; participation, in fact, to the extent where the community begins to get a true sense of identity and belonging for the new educational facility which their children will attend. The absence of such early involvement relates directly to the psychological distance between parents and the school and is probably transmitted directly or indirectly in turn to the youngsters who then begin to perceive school as somewhat less than a constructive, meaningful, hopeful, and friendly place.

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AN APPROACH TO PLANNING

Physical facilities can best serve their intended purpose if the scope of the program, content of the curriculum, and some general understanding has been achieved concerning educational methods. This is perhaps the most difficult and possibly the weakest part of most physical environment plans. Educational aims and objectives, goals, and philosophies are not easy to define. The words are not easily understood—at least not clearly delineated. This is compounded by the fact that we live in an everchanging society and this society and this change must be reflected in the educational system. Part of this problem can be better understood if we recognize that a teacher may have grown up in one society, be teaching in still another, and teaching pupils who will live in still a third.

With things in such a rapid state of change, plans should allow for alteration up until the last moment. Adequate discussion among and between administrator and architect, architect and contractor, contractor and subcontractor needs to take place so that last minute changes can be accomplished without hostility and resentment. Following is a list of questions that might be considered in the planning of a special education facility:

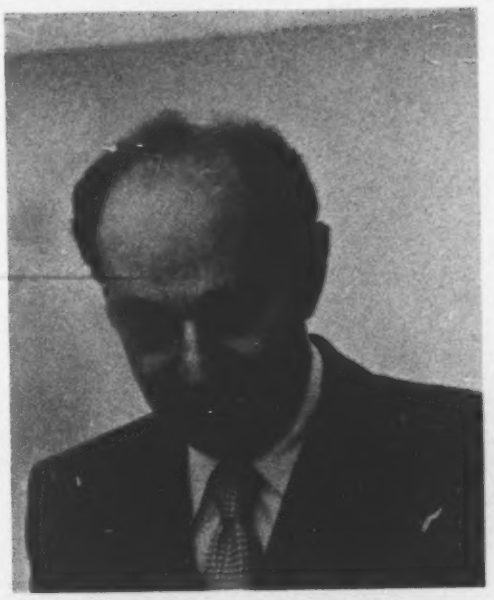
—Who should be on the planning team? Why is each person there?
—What is the program that will be carried out in the facility?
—What elements of the community will want to be kept informed as plans progress?
—To the extent children's attention needs to be focused on an assigned task, how can the structure aid in accomplishing this?
—What types of spaces fit the programs as planned? What auxiliary personnel, visitors, or parents will be coming into the area and how will they be accommodated?
—Does the program lend itself to observation? Who will the observers be and what facilities will be needed to accommodate them?
—What accommodation will be made for students of varying ability as they arrive and depart the facility?
—What is the relationship between safety equipment and students with varying needs?
—What extra use can be made of the facility by parents and/or community?

—What patterns of traffic need to be considered to make the facility available and adaptable?
—What are some of the mechanical considerations that will allow the program to be flexible?
—What is the relationship between outdoor area, school community, and the educational program?
—What special consideration needs to be given to the use of exterior areas?
—How can the proper storage and accessibility of equipment, materials, supplies, and transient articles be assured?

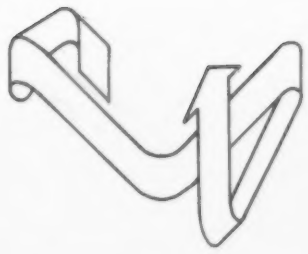
Members of the planning team should be creative people—people who use imagination and new ideas—people who want to put new ideas into action. . . .

A major role of a school administrator, a potential head of the planning team, should be to listen to teachers, evaluate what they are saying in terms of stated goals and objectives and effective methodology, and then remove any obstacle that stands in their way. This may mean construction of a facility, redesigning space, or changing the teacher's outlook. It could mean purchasing equipment, obtaining supplies, or instructing a teacher in the use of available resources. It could mean changing a teacher's assignment, adding auxiliary personnel, or reducing class size.

Charles Woodcock



Sidney Eisenshtat



RALPH BAIRD *is Director, Department of Special Education, Tacoma Public Schools, Tacoma, Washington.*

AN APPROACH TO PLANNING

There is a great need for special educators to describe in detail the activities to be performed in an environment. This enables those familiar with research and environmental factors to give adequate consideration to a design which will not only permit these activities to take place, but will encourage maximum educational development. For instance, the range of activities to be performed determines the amount of heat and light that will be needed . . . amplification devices if deaf children are involved . . . will too little noise discourage interaction . . . but not too noisy to encourage the desired learning to take place . . . will tactile stimuli enhance or limit the instructional program . . . carpet can provide a desirable effect if the educational goals relate to listening skills . . . but if an instructional goal is the development of mobility skills for a physically handicapped child, the carpet might be a barrier for too much effort will be needed. . . .

Educators often have not been instructed to assess the environment as to its effect on the desired learning goals. A building or a particular environment can make learning possible. It can encourage learning, it may discourage learning, but the attitude of the teacher and the attitude of the child are the two major factors in a good educational program.

The educational philosophy of the facility demands consideration. What is the relationship between the program under consideration and the regular district program or other special programs? Is it to be an isolated program? Is integration to be considered? If so, what areas of curriculum are to be considered? Is the process to be progressive? In other words, are you working toward increasingly greater integration? If so, what are the planned starting points, and how can the facility assist in the progressive development of integration? Is integration to be total? Are the children to be included in regular programing and only moved to resource areas for specific types of help? Consideration must be given to each one of these possibilities before the building is actually constructed.

What about the program philosophy? Is it specific? In other words, is the program designed to assist in the modification of behavior? Is it a program designed to deal only with the production of oral deaf students? Is the pro-

gram philosophy one in which many different approaches to solving problems for the population are being considered? If so, the facility should assist in adapting various programs to the spaces where the children are to be housed. How is the building to be used? In other words, the schedule of use? What about the daily schedule? Certainly the number of spaces, the type of heating, and the type of lighting will affect it.

The planning function is both long range and short range. The effectiveness of short range planning very often depends upon how much thought has been put into the collection of data over a long period of time. The long range plan must take into consideration as many factors as possible if effective planning is to take place. Some of the factors that must be considered are general community needs. Specifically what are the employment opportunities in the community; what type of trained individual must be prepared? Population projections, based not only on past experience but present figures considering the preschool population within the confines of the planning area, must be taken into consideration. Anticipated industrial business or housing developments must be considered in every plan. What are the areas of potential growth? Where are the areas of potential displacement of the existing population; in what areas is urban renewal being considered? Those in special education should also consider the effects of epidemics or other health problems which may disable youngsters; the effects of drug abuse or other environmental occurrences. All of these factors must be considered in determining if and where a facility should be built.

In the long range program, consideration should be given to the availability of staff to accomplish the planned program. Are the professional staff people available in sufficient numbers to be considered as part of the plan for a facility? If not, perhaps contact should be made with colleges and universities to assist in the preparation of professionals, or an effort should be made to recruit the required professionals from other areas of the country. Paraprofessionals are another factor in staffing. Are programs available which can prepare nonprofessionals to assist in working with handicapped children? If such programs are not in operation, perhaps consideration should be given to the development of an inservice or

college program which would assist in the development of adequately trained paraprofessionals.

Are the funds available at the federal level, at the state level, at the local public level, and at the private level, to insure that the program can take place after the facility is built?

It is essential that a very precise definition of the project under consideration be established. What type of a facility is being considered? Is it a room in a school? If so, is it going to be a new school with some rooms for special education? If so, consideration should be given to a flow between the special education students and the students in the regular program to provide as normal a learning opportunity as is possible. If it is an addition to an existing school the location and size may be limited by the shape of the land, the size of the building, and the potential within the existing structure for additional buildings.

Planners must look at the population to be served. What type or types of children are going to be served by the new facility or any facility for that matter? What are their special needs? What age group is to be served by the school? How many children are you talking about?

One cannot emphasize enough the importance of stating the intent and the purpose of the instructional program. To understand this, look at a youngster and see how he explores his environment, how he finds satisfaction, how he creates. What are the materials of his creation? More often than not, the way he is structured and limited will encourage creativity or encourage conformity. Educators must stress and look for the similarities in the needs of children with different disabilities so that they do not create a series of spaces which may be of little or no use after a group of children with a given disability pass through the school structure. The purpose of schools is the education of youth for life. We must constantly remind ourselves of this fact. . . .

THE PLANNERS

One of the fundamentals often overlooked in the organization of the project team is that you should include only those people to whom you intend to lis-

ten. This does not mean that people will have all of their ideas incorporated into the plan. It does mean that if you have predetermined that only educational planners will be listened to in the preparation of the school facility, it is useless to waste the time of community members such as parents, children, and community leaders. It is possible that many people may be interested in just listening, but very often they feel their time is valuable, and they feel that they have many suggestions that should be heeded in planning a school.

The number of persons considered for inclusion on the project team may vary depending on the size and scope of the project, but generally members of the board, administrative staff, including the superintendent's immediate staff, those included in budget, planning, personnel, pupil personnel services, as well as the individual building administrators, should be considered in discussing plans. The instructional staff should certainly be represented by teachers as well as curriculum specialists. If the building or "re-structure" is being designed for disabled youngsters, certainly physical therapists, occupational therapists, speech and hearing therapists, psychologists, social workers, or counselors should be considered.

Paraprofessionals might also be considered as potential team members in the planning of a facility. This area is relatively new and has not yet been accepted as an integral part of many school programs. More and more, the teacher aide, the therapy aide, the tenants, recreational aides, and vocational aides are being trained and are involved in working with handicapped youngsters.

The secretarial service representatives as well as custodial and maintenance people must be considered at the appropriate time, and particularly in the areas of planning, where their expertise can be of assistance in areas that others might overlook. One cannot underestimate the value of all of these people to the instructional program. While many school districts are sufficiently endowed with a professionally trained staff who provide answers to many of the questions relating to the development of new facilities, there are other professional people who should also be involved: the architect, if possible selected very early in the planning; the engineers,

who might be helpful to the project if the architect does not feel comfortable in making certain determinations; educational consultants, either state, college, or university level, or those from private firms, if the field of endeavor is relatively new to the district at the time of planning; or community planners who might assist in seeing where the school fits into community plans, both for the regular instructional program and for after school and nonschool day or year activities. Other community representatives who might be helpful are the students, either those currently in the program or those who have previously been in the program and have a real impression of experiences with existing facilities or special planned facilities in other communities; the parents, who are not only the taxpayers, but are very knowledgeable listeners as the program relates to the overall needs of their children, both in a nonschool setting as well as a school setting; representatives of other governmental bodies who may have contributions to make, including the public health people and the people who are looking at population movement within the area. The type of personnel and their responsibilities vary greatly from community to community. Private agencies representing the handicapped might also be involved.

One very distinct advantage of using the community is the fact that it involves the people who may be funding the program and it allows parents to participate in the education of their children. In this age of specialization and great diversity of information, it is very difficult for the teacher or even the variety of specialists that we have in the school to have all the knowledge or observational skills that will improve the performance levels of children.

AN APPROACH TO PLANNING

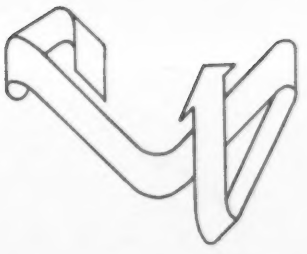
All projects must start with words. It is extremely important that there is some method of organizing and administering the material which must be compiled in order to have a successful project. The development of a program narrative is the most important single phase. Projects fail because the program is never really defined. It is the responsibility of the educator to author the program narrative. An attempt must be made to define what is actually to take place between the child and the teacher. If a program is to be flexible or changeable then the how and why regarding the change should be stated. It is imperative not to let "hardware" control the thinking. Develop what the program is to accomplish and then later find the hardware to do the job.

THE PLANNERS

It is suggested that a team be organized to handle the job of planning a facility. This team should be made of various components for input who will be able to take ideas and implement them, in logical sequence, into the finished product. For a successful operation it is necessary that many people become involved and obtain an awareness of what is to be done. Through government agencies, which may become involved, will come a variety of input data. From these as well as from local sources, information must be extracted, analyzed, and put into a meaningful dialogue.

Before a reasonable selection of the team members can be made, it is imperative to make a brief analysis of the people, department, and government agencies which will be involved either directly or individually in the project. An organization chart will be most useful in explaining the lines of communication to those involved in the project.

Once the lines of communication have been established it is necessary to set up a team to work within this organizational structure. It may be helpful to use existing organizational setups rather than restructuring for a particular project. This team should form a workable, usable communication system which is capable of translating needs into the end product. It is essential that the team have rapport so that the spirit and intent can be maintained while the project is being technologically implemented.



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The head of the team could logically be the director of special education. Other members of the team should include the special education staff, supervisors, professional consultants, school board building department, curriculum committee, building committee, or perhaps a school board member who has special interest in the project, and the architect. The team then should be structured so that there is a method of communicating directly with all other agencies involved either from a financial, political, regulatory, or professional guidance area.

Organization of the team should be followed by the production of the program narrative and the production of the architectural program. The architect may or may not be involved in the first phase. However, it is imperative that the central core of the team be maintained throughout the project.

THE ARCHITECT

If the architect has been selected in the beginning stages, it is suggested that he be used by the team as a sounding board for information about site limitations, budget limits, and things of this type. It may be useful for him to be involved at the beginning to get the spirit of the project.

After the educational program narrative has been completed it is advisable to have the architect on the facilities development team as it develops yet another area—the architectural narrative. The purpose of this narrative is to translate the program narrative into specific measurements of space and hardware. It should be kept in mind that the program narrative dictates the space requirements and not the reverse.

One of the first steps in developing the architectural narrative is attempting to define overall square footage available to the project as related to the budget. A much better approach would be to establish square footage based on the program narrative, establish a budget, and request funds which will meet this requirement. After the square footage has been established the allocation must be broken down to the various spaces which will be required by the program. Superimposed on this will be the regulatory requirements of building codes, state departments of educa-

tion, and local planning departments. It may be well to leave certain options open to the architect in order for him to develop a more imaginative solution to the program.

After the completion and approval of the architectural narrative, the architect can start developing plans for the project whether on a large or small scale. Note that this is the first time that drawings or pictures have been considered in this process. Depending on the architect's legal contract the following method may have to be adjusted regarding submissions of drawings. However, this is a fairly standard and logical sequence.

SCHEMATIC DRAWINGS. Schematic drawings should consist of single line scale drawings showing the floor plan or plans of the project. The drawings should indicate sizes of the various elements, relevant location, and circulation between the elements. It should also indicate the relationships to existing buildings and to the site. A schematic site plan should show the proposed vehicular and pedestrian traffic flow, general location of service utilities, and recreation activities.

At this point the major decisions as to how well the proposed building or modifications fulfill the requirements of the program narrative and architectural narrative can and should be made. There is no point in the architect proceeding further until this question has been answered and approved in writing by all concerned. This perhaps will be the most important step in the process for a successful project. At this point it is much easier to review the concepts than it will be at any later time.

After approval of the schematics the architect should proceed with the preliminary plans. Additional conferences will be necessary with the facilities development team to define more clearly some of the details. The architect will develop the plans in greater detail, generally demonstrated by the use of drawings or renderings of the projects. A model, if provided for in the contract, would be useful at this point. It is difficult for most people to read, understand, and evaluate two-dimensional drawings. It is unfair to the architect, the educator, and the children when this is not

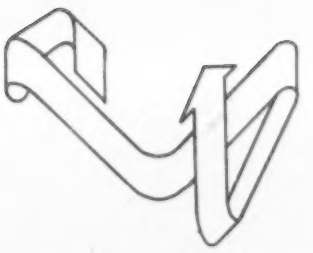
readily admitted or understood. Again, review, approval, and a check for meeting the program needs should be done in writing.

WORKING DRAWINGS (contract documents). After approval of the preliminaries the architect will proceed with the preparation of the contract documents. It might be noted that the drawing and specifications are still a set of instructions for workmen to build a facility which is to house the educational program. It is suggested that the team review the contract documents at the 30 percent completed stage for consistency with the established program and again at 90 percent completion. The architect will also require submissions to the various regulatory agencies. During the contract document stage there should be very little change in the project if the preliminaries were completed and were developed to the proper extent.

CONSTRUCTION OF FACILITY. Upon completion of the contract documents they should be sent or made available to various contributors for bids on the work. Upon receipt of bids, if the award of the contract is able to be made within the funds available, the award will be made and the contractor will begin construction. If, however, the project is over the budget, then modifications must be made. Depending on the amount to be deducted, changes will be made in the contract documents. Should these changes be sufficient to require reallocations of space or reduction of space, the project team should be consulted since this will undoubtedly affect the program. The decision for what is to be changed in the program belongs to the educator, and compromises as to the building plans must be worked out with the architect.

AN APPROACH TO PLANNING

It is important to design physical facilities which permit the effective implementation of special education programs. The term "design process" is significant. It suggests that a design for a facility occurs not only by having an architect produce designs of classrooms but also through a lengthy data gathering and assessing process that is centered upon an analysis of the behaviors and activities that will occur in the new environment.



ALAN ABESON, *Coordinator of the Project*—Physical Environment and Special Education, *is presently Director, State-Federal Information Clearinghouse for Exceptional Children, The Council for Exceptional Children, Arlington, Virginia.*

In the past, educators have approached the design process when they have engaged in the preparation of the educational specifications. Particular attention has been devoted to listing the furnishings and equipment that are needed. The problem, however, is that the specifications are rarely prepared with sufficient precision or completeness to be of great use to the architect. This is particularly true in describing many of the seemingly unimportant daily events. Children take drinks, walk to the blackboard, stand at their seats. Although these actions may seem unimportant, the architect may see implications for design which will facilitate the realization of many such activities. Such an approach by the architect requires his appreciation of the positive effects which can be transmitted or reinforced by the environment. Consider an example: Most classrooms and schools are designed to admit children directly into the classrooms from the hall to outdoors. Boots, coats, lunches, etc. are deposited in the main classroom and "arrival behavior" occurs there as well. Some time must be taken by the teacher to stop that behavior and prepare the children for the learning activities of the day. If an anteroom were available, separated by some type of barrier from the learning space, the children could enter the learning area knowing that "it is time to learn and we start by coming into this space." Because mood and attitude can be influenced by environment, perhaps it would make a difference in behavior.

More and more, facilities for exceptional children are being planned as an inclusive portion of total educational facilities. Recognition of the needs of these children is resulting in the provision of specially designed educational environments within the facility. All planning should occur within the context of a philosophy of education that clearly delineates the objectives of the local program.

Educators place a good deal of emphasis on the necessity for a philosophy because, without it, many questions relating to the type of educational program desired and the subsequent environment cannot be answered. If a planner is weighing whether or not to provide folding walls within a classroom to encourage small group work with different teachers, consideration of the philosophical statement will assist in decision making. Similarly, the question of whether to provide a continuing education program and facilities for adult special education students will in part be answered by studying the objectives stated in the philosophy. Prior to designing a facility, the philosophy must be carefully stated and interpreted by the educator for the architect.

Another consideration in planning facilities for exceptional children is the fact that the needs of children continually vary as they grow, learn, and change. This concept is particularly important when applied to exceptional children, for there may be a tendency on the part of planners to provide a physical environment so specially tailored to their unique needs that after school hours and ultimately, after completing school, the adjustment to the "real" world may be extremely difficult.

There are other things to consider in the beginning planning stages. Popularized concepts should not always be accepted as requirements for buildings or for any changes that are being made. Many programs submitted to architects include a request for the provision of "maximum flexibility." But where should it occur, and how? More importantly, why? Many classrooms now are constructed with the capability of connecting through the removal of a variety of types of temporary walls. However, many teachers with these resources rarely use them. This is only one reason for engaging in the careful preparation of individual programs.

The act of asking the teachers about the use of their rooms is a simple form of evaluating the environment. It is important to engage in as complete an evaluation as possible of existing and new facilities. This objective can be accomplished more effectively by comparing the teacher's reactions to the environment with the original program objectives given to the architect.

Once the evaluation is completed, the results should not be filed away, but should be incorporated in the program for the next facility.

The analysis of the teaching-learning program for the planning process is directed toward the development of a statement which describes the needs of the educational program to be located in the newly designed or renovated environment. The development of this statement requires considerable time, effort, expertise, and coordination. The approach to this task involves dividing the total range of activities that occur in the school into sections. Persons most familiar with each section can then describe the activities in a manner that will permit the architect to understand the necessary environmental requirements.

THE PLANNERS

The architect should be continually meeting with the persons involved in the preparation of a facility. He should be observing the way in which the programs occur—especially regarding the needs of the children—and the techniques and materials used by the teachers as they attempt to meet these needs. He should be asking questions that sharpen his own understanding of the workings of the program, and assisting the planning staff as they consider and evaluate the present use of their environment in relation to their needs in the new facility or in the modifications of an older building. The architect, accompanied by special educators, should visit other facilities and examine relevant literature to collect information and ideas for possible application in the planned building.

At the completion of the program narrative, the architect should spend considerable time with the educators attempting to completely understand the specifics of the narrative prior to beginning the first designs. As designs are developed, ample opportunity should be provided for their review by the educators. This aspect of the planning process should be considered as a refinement stage.

Obstacles are inherent in the creation of multidisciplinary planning efforts. One of these is overcoming the barrier to communication that may exist between the designer-architect and the educator. Designers frequently ad-

mit that they prefer graphic to verbal expression. Because educators live their entire lives using verbal expression, an immediate problem is evident. Confusion of word meaning may produce significant confusion during discussions and planning.

Since educators and architects each tend to speak their own language, extensive efforts must occur to achieve a common understanding. The educational terms "team teaching," "grouping," and "experience unit teaching" are but a few examples. Similarly in architectural lingo, "schematics," "circulation," "scale," and "surface" are used. By conveying the demands of the environment in educational terms to the architect, the educator must clarify each concept to permit design decisions to be made most accurately. The educator can no longer say to an architect, "We need a 24 classroom school with the usual facilities" nor can he and his staff prepare a set of educational specifications for delivery to an absentee architect at a later date. To create communication, the feeling must be that both educators and architects have a contribution which can be made effectively only through interaction. The attempt to achieve interaction results in a clarification of vocabulary, objectives, and areas of competency. This clarification process is furthered by joint planning by the architect and educator to insure that the architect properly is exposed to the needs of handicapped children.

Another question that must be raised pertaining to architect involvement is how much time the architect can economically afford to spend planning a facility. Since his time must be limited, carefully determined plans should precede the arrival of the architect to insure that his maximum contribution is obtained. Perhaps the architect should meet initially with the educational staff or committee that will develop the specifications to indicate some of the information he requires. Although the architect should work with the planning group the committee should, upon completing the specifications, further interpret them for the architect. This should be coupled with the architect spending time in the schools, seeing what occurs, and learning about the children. The architect and representatives of the committee should also interview staff to obtain individual information not contained in the summary program narrative. Certainly, an effective working relationship between the architect and educational staff will prove valuable when reactions to the preliminary sketches are needed.

AN APPROACH TO PLANNING

The environment should not be a conglomeration of sticks and stones. Rather it should be a dynamic and changeable series of elements that can be a positive tool for learning. Implicit in any consideration of a manmade environment is the idea that man can control the concepts, structure, and use of the three dimensional world and that his power to do this should manifest itself across the entire spectrum of human activity. The duty and responsibility of the architect is that of translator as well as designer: to translate into three dimensional language a series of human needs based on change. Effective translation can occur only if the goals and activities that will take place in this environment are made clear. They must reflect and confirm the nature and reasons—the purpose for which the physical environment is intended. Learning is an obvious goal, but a physical structure should also enhance and support the interaction between people involved with each other.

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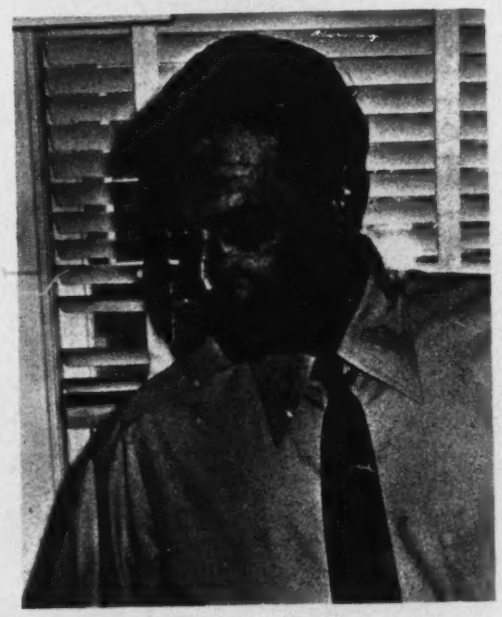

The appropriateness of an environment for learning is not often considered with the learning process itself. Only through identifying how children learn and how their teachers and parents manipulate the learning world to help them with their tasks can this appropriateness be determined. Certain assumptions must be made, however vague, about the usefulness, effectiveness, and efficiency of the sensory, intellectual, and material resources that are brought to bear in the learning process. Hearing and seeing are primary, but touching, smelling, and tasting also provide important channels through which learning takes place. Matching the tasks with the resources available, and in turn the goals of learning with the process by which these goals are reached, can be reflected in specific ways by the environmental construct—the building in which the tasks are carried out and goals achieved.

Accurately predicting the use of learning spaces prior to the time a learning program begins is at best a difficult task. However, unless present and future learning programs and the persons involved in them can be described with some accuracy, it is almost assured that the learning space will not realize its potential. For this reason it might be wise to analyze the elements most frequently found in teaching and learning situations

and to suggest how they might be manipulated to better serve educational purposes. The following might be used as a checklist of items to be considered in the designing and planning of a learning environment:

—For whom are we designing? What are the demographic and educational characteristics of the group for whom the educational plant is being built? What are their primary disabilities? What are their strengths?

—What are the goals for this group? Are educational and societal goals the same or different? If so, in what way? Can these goals be effected? What are the best methods for obtaining these goals?

—What are the child's immediate environmental and personal needs?

—How can the environment be manipulated to reach the aforementioned goals?

—How can we form an educationally sound interaction of children, teachers, curriculum, and environment?

—What provisions can or should be made for parents?

—What is the developmental process? When should environmental changes occur to reflect development? When, for example, should doors be supplied with doorknobs rather than pulls?

As an example of the type of thinking that should occur, desks and tables might come under careful consideration. Is it the desire of the teacher as an important part of the learning process to have children see one another? Semicircular seating arrangements allow children to see and better hear what others are saying and doing. This is particularly true in the education of the deaf—as one example, where both oral and manual languages are used. Communication between many persons can only be carried on if they can see each other.

Without knowing the sequence of events that occurs within the learning framework of the school, it is almost impossible to adequately provide the stage upon which learning can take place. Descriptive words directly related to identifying the components of a learning program may be used to organize the fragments or segments which compose the total learning program. (Words like free time, independent activity, controlled activity, work assessment, time for moving from one place to another, times during which the teacher must be close to the child, constitute examples.)

These and many others may be used to construct a framework useful to the architect and educator in designing an efficient, effective, and hopefully, an exciting environment for learning.

Other questions might be asked that will reduce the possibility for error in designing the classroom building and, in turn, allow the environment to actively assist the teacher in accomplishing educational goals. More important, these considerations will help the children to feel that they have a stake in the physical environment. Within the technological capability of the design field there are untouched possibilities for making the environment more responsive to educational needs. It can be hypothesized that if the children help in modifying their environment, either alone or with their teacher, it will have more meaning to them as they use it for all the purposes for which the school exists. Other relevant questions include: Can the rooms be changed? Can desks be moved? Can school take place outside the classroom when weather permits? Can children see and hear each other inside or outside?

Another facet of the physical environment which deals directly with exceptional children is the concept of attention span. Much has been said about attention span—the ability to concentrate on a task without distraction—and of the usefulness of group activity versus individual study. To make these items relevant in the environmental sense, it is necessary to determine in what way the physical environment may support the positive aspirations of a learning program and assist in negating those which make the teacher less effective in the classroom or the school. Special attention should be given to identifying and manipulating those elements in the physical environment which can increase attention span.

If a child learns better or faster or more effectively without seeing other children at work, then he should be isolated. If it is necessary within the learning program for children to work together, then it should be the responsibility of the teacher, researcher, and administrator to determine how this can best be done—at a table, on the floor, within a given area without physical limits, or by drawing a stripe on the floor to suggest that within the stripes certain activities will take place. Then

similarly what games suggest a relationship to learning activity, and can they take place in a classroom, in a corridor, in the cafeteria, on the playground, or in the neighborhood? A conscious effort to determine what are noisy and quiet spaces and at what level noise can be tolerated within a given set of activities might also be helpful to the environmental designer.

It might be wise, for discussion purposes, to place flexible elements within the learning space into general categories. Most important, it should be incumbent with identifying these items that purposes for their change in location be considered in terms of education objectives. It must be recognized that modification of elements results in some changes in how information flows from the teacher to the child and back again. It may also be true that changing elements in the classroom may have a social purpose, such as making room for games or providing a space for children and teachers to meet with one another for nonacademic reasons. It also might be indicated that space has a maintenance purpose. This means that the children and teacher maintain those areas of the learning space and adjacent spaces which are of particular concern to them during their activities: as examples, something as simple as a storage unit in which a child stores his materials, coats, and other learning equipment, and for the teacher, private places where he might work, store personal articles, and meet other teachers or visitors to the classroom.

Perhaps it is becoming apparent that all of the elements in the classroom exist in a loosely integrated system that can be manipulated by the students and teachers to achieve the educational goals set by both. The elements are interrelated. They can be made dynamic and exciting through simple manipulation based on the imagination of the architect, the teachers, and the students.

AN APPROACH TO PLANNING

On the surface, the history of school planning and construction appears always to have been embedded in research design and to have drawn on carefully defined educational, architectural, and construction models. Construction materials used in school building are carefully selected on the basis of durability, fire resistance, economy, and related factors essential to contemporary design problems. The concept of standard classroom size, cubic footage, and lighting is accepted into architectural practice through rigid state education department standards for school construction, school health, and safety. Air circulation at a specified number of times per hour is regulated by departments of health and these specifications are incorporated into building and engineering plans. Architects and school officials vie with one another to incorporate innovative concepts into building plans which will set a new school building apart from others, call attention both to the school system and to the architect. As a result many beautiful schools exist, and millions of children are receiving an education in them.

Few school buildings, however, are conceptualized, designed, and constructed to meet the learning needs of the children for whom the structure is intended. Doorknobs, for example, may be of such a size and the doors of such a weight that a 5 year old child cannot enter with ease. In his initial efforts to adjust to his teacher, school, and the educational process the child is confronted by physical factors which make even entering a school difficult. Windows may be placed for adult usage, or at a level where small children cannot easily view the world outside and learn from this experience. The characteristics of a classroom are infrequently conceived in terms of the actual learning needs of the children and of the teacher who will use the learning environment. What should this area be? How should it be used? What are its needed dimensions and structure in terms of the learning program and the ages of the children who will be in it? Some will say that answers to these questions are known; others, that structure is dictated by program. If indeed these replies are correct, the research which supports either of these positions is not easy to come by.

Recently one of the authors had occasion to visit a new school building. It is a strange looking building, not at all like the traditional school. It includes

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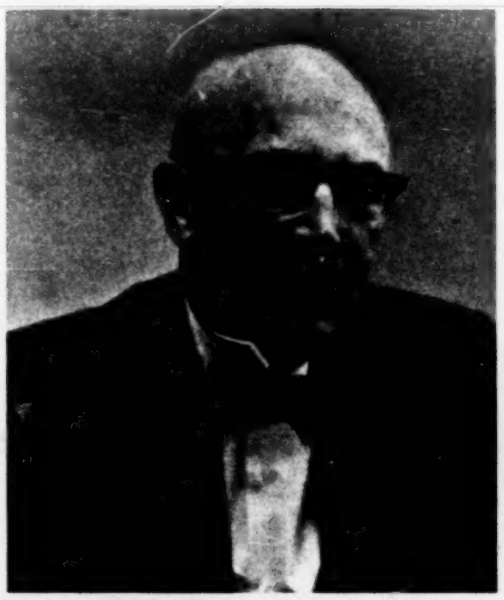
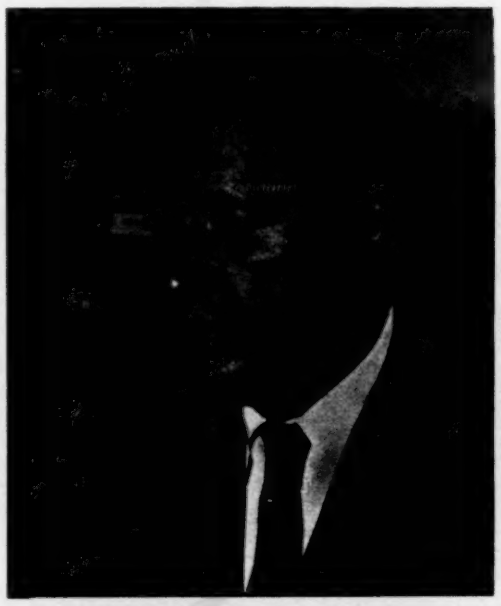
Editor's Note: This material is adapted from an article that appeared in *Exceptional Children,* December, 1970



William M. Cruickshank



Herbert C. Quay

six large rooms, each capable of housing approximately 150 children. The school is to be operated on the basis of an ungraded structure with five or six teachers in each classroom at all times, working with smaller groups of children extracted from the larger group. Each room has been constructed to include study areas and sunken or depressed areas in the floor in which group activities can be carried out. The entire room is covered with wall to wall carpeting. The room is air conditioned; thus it is windowless. On first examination each room appears to include everything which might be needed in the education of children.

But what is the research basis on which this school and these rooms have been designed? The superintendent of schools replied that the rooms were designed in terms of the philosophy of the ungraded program and on the basis of careful planning and consideration by both his administrative staff, the teachers, and the architects. Few if any studies have been undertaken to determine that children can learn better together in smaller or larger ungraded groups. Little, if anything, is known about the capacity of six adults with different personalities, somewhat different training, and different interpretations of the term ungraded to be able to function together in a common teaching arena. The capacity to function in a team teaching situation is not an innate trait of educators. If this is true, what antecedents have preceded the actual delivery of services to the child consumers? On what basis is this success predetermined for this teaching group and this teaching method in this type of teaching situation? Is the standard classroom merely multiplied by six the environment which is essential to learning for more than a hundred children? The visitor was assured that it was: Air circulation had been carefully assessed; lighting was of the latest specifications; teaching stations were carefully plotted within the area; water, toilets, and work areas had been delineated. But little is known about the capacity of children to learn in such a situation. Less is known about the capacity of teachers to adjust to other teachers over a long term period in a common teaching area and at the same time deliver high quality education to children. Research is lacking regarding the fatigue factor in learning for both children and teacher when seated for long periods of time on steps in a depressed floor arena. Much is yet to be understood regarding the social dynamics of large groups and subgroups of children: this knowledge would

be important to adults in structuring the learning situation and would play a role in the development of environmental structure or design. A decade hence if the program is found unworkable, it will not be the physical structure itself on which the blame will be laid. The teachers and the architect, among others, will share the blame. What programatic research will be the basis for changing the educational structure and design if the original one is found lacking in some or all respects?

Examples of this nature could be duplicated in dozens of other communities. A rehabilitation center in one community has been constructed with four floors. From the first to the fourth floor, apartments in which physically handicapped and mentally handicapped adults will live become progressively less adapted to the presumed needs of the handicapped, on the premise that as the individual moves upward from floor to floor he will have learned through the center's educational program to deal more adequately with normal living conditions. Absolutely no research is available to support this predetermined educational philosophy nor to support the architectural changes from floor to floor which are presumed to bring the handicapped person by degrees into a normal living situation. Before occupation by the first client, some staff members have pointed out problems with structure. This does not appear to have been wise educational or architectural planning.

If general education is remiss in bringing to architectural programing the best in research design, special education for handicapped children is typified by an even less scientific approach. For decades, special education has been characterized by emotional attitudes in planning for handicapped children by supposed modifications of what is good for normal children. But what are the learning needs of handicapped children? For example, deaf children and those with lesser degrees of hearing loss who should at all times be able to see the teacher's face for speechreading development, are placed at desks and in chairs which during the majority of the school day provide an excellent knee view of their teachers but a poor face view of the learning area from which most speechreading will be learned. Schools and classes for deaf children are being constructed almost continuously. Few schoolrooms, however, are constructed in which these children are

raised in their desks and chairs to eye level with their teacher. This example of lack of programatic and architectural research could be replicated many times in the education of most types of handicapped children. Educators complain that deaf children progress slowly and are downgraded in terms of social age and school achievement. This is due not to the nature of the child but to the nature of the learning environment which has been predetermined on the basis of little or no research.

There are many schools which have been built for so called crippled children. Bringing children to the point where they can become independently ambulatory either with or without crutches or wheelchairs is a generally accepted goal of physical therapy and education. Much of the child's educational program in these schools and classes is directed to this end. The ability of a child to become mobile is attitudinal as well as physical. Moving with assurance and independence requires that the person anticipate his moves and what they will entail and encounter. He needs to be able to anticipate obstacles, traffic, and new spatial areas. Crutches and wheelchairs usually require the user to get into the flow of traffic before the individual can see what the new spatial area requires of him. But very little research has been done to design and construct schools for physically handicapped children so that there will be no corners in hallways, so that classroom doors will not be recessed, and so that vision will be unobstructed for the individual entering into a new spatial area. If schools cannot be built without corners, then it could be possible to construct corners with unbreakable glass in order to give unobstructed views of oncoming traffic and thereby support the child. Such environmental modification could well enhance the psychological development of the child. There is no validated research to demonstrate the value of the traditional concept or of the innovative suggestion which is made here.

The preliminary Architecture and Special Education Project sponsored by The Council for Exceptional Children under a grant from the US Office of Education is perhaps as thorough a national survey as has ever been made on this topic. The collected information is indeed disturbing. Lack of local planning, lack of definitive research to support many educational or architectural decisions, agreements between architect and educator based on

supposedly educated hunches, and planning primarily on the part of business or administrator-type educators on the basis of site visits to other recently constructed buildings is in evidence throughout the survey. Billions of dollars in school construction are being invested by the nation through local boards of education with practically no research data reflecting the known interface between environmental design and the needs of the learning situation and the learner.

Two elements, slighted in the findings, must precede research design or actual construction with or without *research on which construction is* based. These are the issues of a program narrative and an architectural narrative.

The program narrative constitutes a description, not of rooms and hallways, but of a carefully developed statement of what the educational program actually is. Nothing should be assumed to be understood. The statement should be inclusive of everything which will be done educationally between teacher and children during the program. The program narrative must be developed by the users of the building, namely the teachers, not by administrators or educational planners who assume that they know what the program is but in fact may have a very inaccurate understanding of it. The program narrative must be detailed and specific in every aspect. To use again the earlier example of teaching children with impaired hearing it is not enough to merely state that speechreading is going to be taught. The teacher must describe the circumstances under which it should be taught well: the physical relationship between the child and the teacher, the physical and visual needs of the child, and all other similar factors which may have an effect on physical structure. As another example, it has been stated that in the education of hyperactive children most of the educational experiences between teacher and child should be carried on within arm's reach. How are the implications of this statement for physical structure translated by the educator into a meaningful program narrative? These are examples of the detail which must be accumulated in terms of every aspect of every educational program.

Out of the program narrative developed by the educators, the architect will develop an architectural narrative as the basis for translating the pro-

gram into the realities of construction. It is at this point that the educational program becomes concrete in terms of rooms, dimensions, room placement, inter- and intraroom relationships, equipment, and persons using the facilities. And it is at this point that research which is focused on the type of physical structure which will most fully implement the program narrative is lacking. We do not know under what type of an educational setting children of given age, physical characteristics, intellectual and perceptual characteristics, and with known and specified learning needs most easily and most effectively assimilate instruction and respond positively to teaching.

These comments point to an area which has not been subjected to the type of controlled research which is required. Research relating educational theory to the specifics of environmental structure and design has some special considerations. This in itself, however, is not unlike research in dozens of other areas. Essentially, the criteria of a good research design appropriate to any or all fields of investigation are also applicable to the area of our concern. Such matters as the control of variables inherent in teacher and pupil personalities is a difficult issue, but it must be accounted for in any reasonable design. The design itself must relate to the subject of the investigation. Problems of measurement, validity, and reliability of the measurements obtained, the statistical processes which are utilized, and analysis of the data which are collected, are each and all important problems. Each of them requires careful planning and appropriate decisions.

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VERBAL

GRAPHIC

Space—"a boundless three-dimensional extent in which objects and events occur and have relative position and direction"—Daniel Webster. Space, as considered within the confines of this book, is synonymous with where the teaching and learning processes for handicapped children occur.

Perhaps one of the most difficult tasks facing the architect and educator is making the teacher aware of the possibilities for utilizing space . . . for making it sufficiently responsive and variable . . . quiet, exciting, inviting for students. Although a classroom may be rigidly constructed without apparent possibilities for change, in almost all instances a given teaching and learning space may be modified to make it more suitable and compatible with learning programs.

Engaging in environmental modification requires that educator and designer develop an awareness of how space is used. This requires careful determination of the way space is presently used so that areas of needed change will be identified. Such information, for example, can be obtained by recording the frequency and kinds of events that occur in the classroom. The teacher can count the number of steps that he takes during a given period of time, noting the activities that were taking place in the classroom, and what people were involved.

If an objective is to reduce distance between teacher and student to increase interaction during specific classroom activities, then some of the following questions might be asked. The teacher might keep track of how much time is spent seated at the desk and what activities occur during those periods. A series of questions dealing with the use of the teacher desk might lead to relocation that would encourage more one-to-one activity. Similar investigations might also suggest times when a teacher's desk should be shielded from a part of the classroom or a visual barrier placed in such a way that only part of the classroom is visible and under direct teacher control. Careful interpretation of a day's or week's activities might even indicate that no desk is needed.

Careful observation, or if resources permit, photography, will show how various surfaces such as floors and walls in the classroom are used; whether or not they are overcrowded or poorly utilized. Should there be more tackboard space and less chalkboard space? How much time do the children actually spend at the chalkboard and are they sitting or standing when they are using it? How does the teacher use the doors on closed cupboards? Should or could these provide more tackboard or display space? How often do children sit on the floor? Where and for what purpose? Where is various equipment related to media production and display located and how frequently is it used? What is the frequency and location of use and where are instructional materials and equipment stored? How many times do children go to a storage unit and remove their own materials? Should storage facilities be accessible to children?

The point of listing these items is to indicate that there are extensive observations that can and should be made about the use of existing space. These observations can be usful both for modifying and planning new facilities. Asking these questions is, as mentioned earlier, a critical element in planning, regardless of whether or not one is planning to build a new facility or to modify an existing one.

During the project-sponsored site visits, many of these questions were asked. As a result a number of problem areas were repeatedly identified. This chapter discusses these problems and also includes some design ideas. The designs are not to be considered as anything more than suggested solutions. They are included for two reasons—to suggest that solutions can be found and to stimulate further thinking.

THE NEED FOR CHANGE

In considering the physical environment, there is nothing more basic than the fact that teachers, children, and programs change. The buildings that house the teachers, children, and programs must reflect and complement these changes.

The type of modifications may involve anything from moving a chair to relocating a wall. Learning spaces are all areas that exist within a school: classrooms, independent work areas, conference rooms, therapy rooms,

lavatories, and cafeterias are just a few. It is probably more evident in the area of special education that children have special learning needs that require more frequent manipulation of space.

There are many possible methods for changing spaces. For instance, teachers and children can restructure the classroom through furniture movement for various lengths of time. The maintenance department of the school system may make more substantive changes such as relocating a wall or partition that could be used for longer periods of time. And, more complex changes can occur—either on a large scale within the school or perhaps in the form of an entirely new building. An order of preference for the most needed and used spaces must—as stated in the planning chapter—be developed.

USING SPACE—THE SURFACES

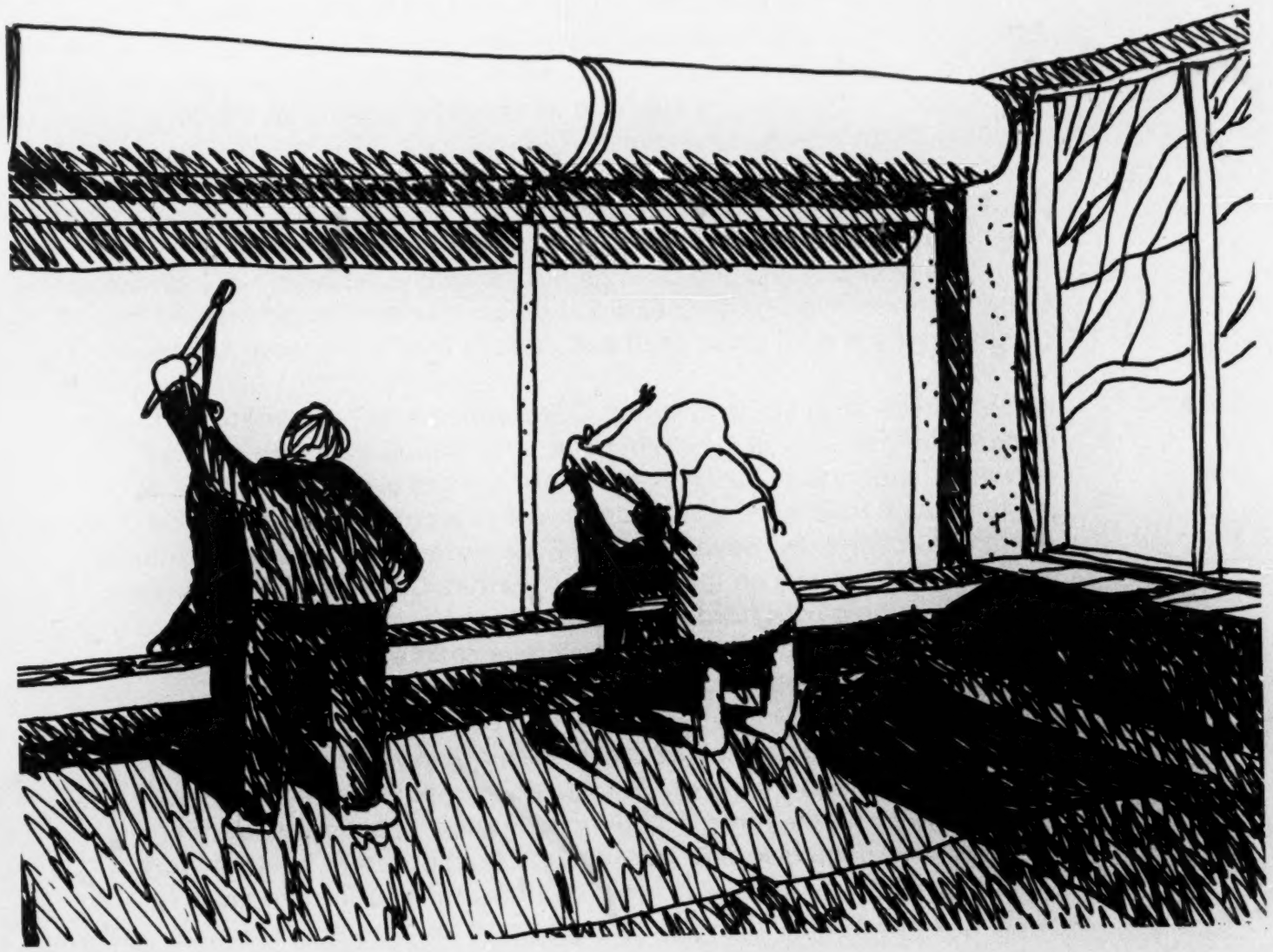
Any learning space—any designed environment—consists of surfaces. There are floors, walls, and ceilings. Traditionally, surfaces have provided climatic control within the space. But if each surface is analyzed for its potential educational use it becomes evident that it has many functions.

Floors and ceilings are usually flat. They are covered with material that is durable, hard or soft, of a certain color and texture, and with specific acoustical properties. Surfaces can make a room quieter or noisier depending upon their hardness or degree of reflectivity since all sound is reflected from surfaces. Beyond this, a floor surface has a certain dynamic quality—people move on it and interact with it. Consider the differences between walking on a hard surface (concrete floor) and a soft surface (carpeted floor) and the effect this has on a child's ability to move about and how he feels as he moves.

The floor is also a potential learning environment. Although most often a flat surface, it has the potential to be depressed or raised. Perhaps floors could be made in removable and "flipable" sections of varying materials and depths so that from time to time different kinds of work could take place. A depressed area might be an art or reading center while a raised area could serve as a platform for dramatic activities. The

floor then is a surface which can be utilized and should not be ignored when assessing the environment.

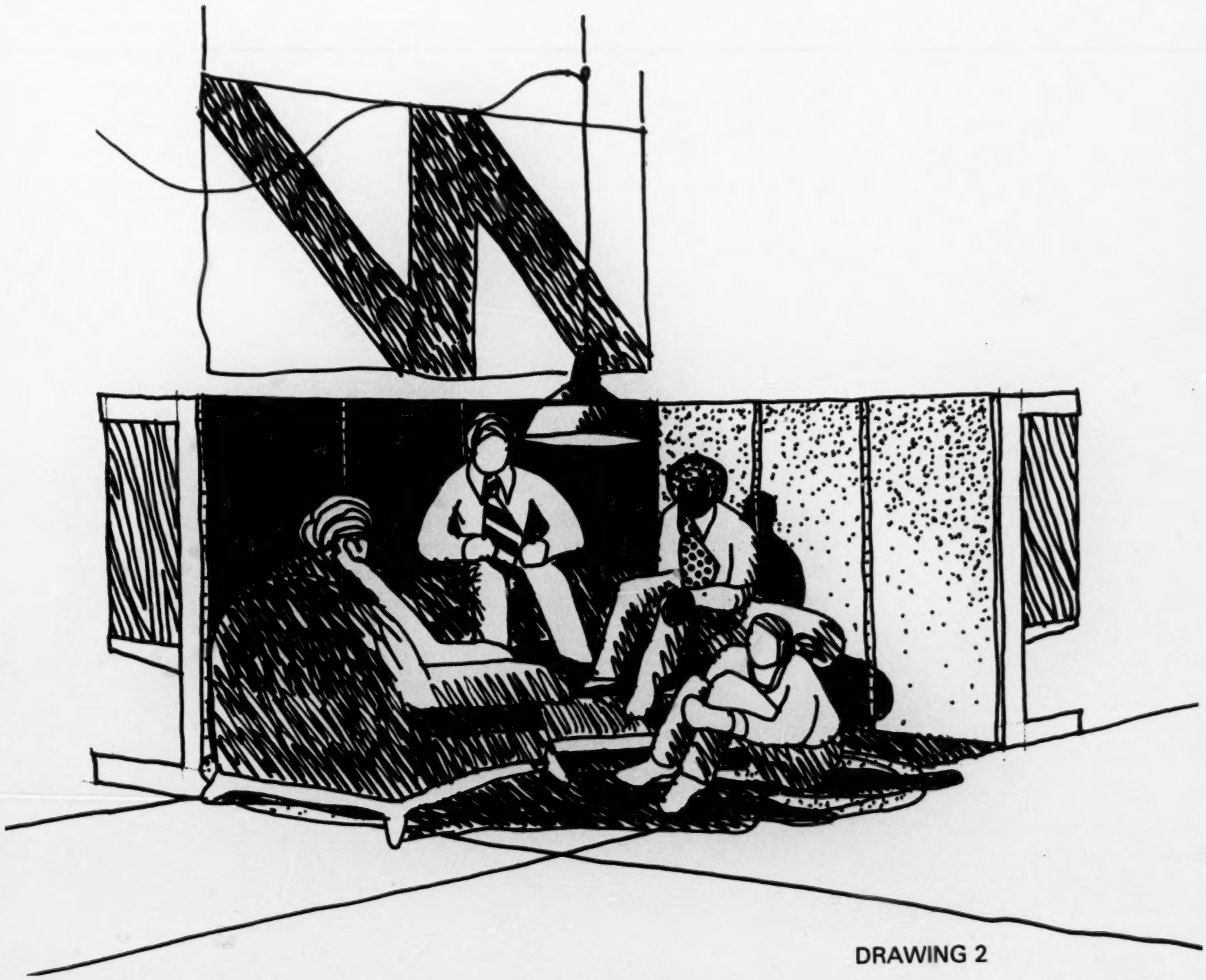
The ceiling within a given space is usually considered the surface that keeps out the rain and the sun and it is something from which to hang light fixtures. A ceiling can be much more than that.



DRAWING 1

A ceiling can also be used for pulling and hanging objects, devices, and display surfaces: Window shades, which could also be screens for media presentation; a paper roll from which a student could pull down a clean surface to draw or paint on; large wall hangings (maybe old flags or cut up shower curtains) to create or define specific areas within a classroom. The ceiling can be effectively used to display artwork.

Drawing 1 is a paper wall. This could be used in an art area. The paper can be rolled down from the top and a clean surface to draw on would then be formed. Shelf clips could be used to adjust the height of the paint shelves. The paper floats under a bench containing the paint shelves.



DRAWING 2

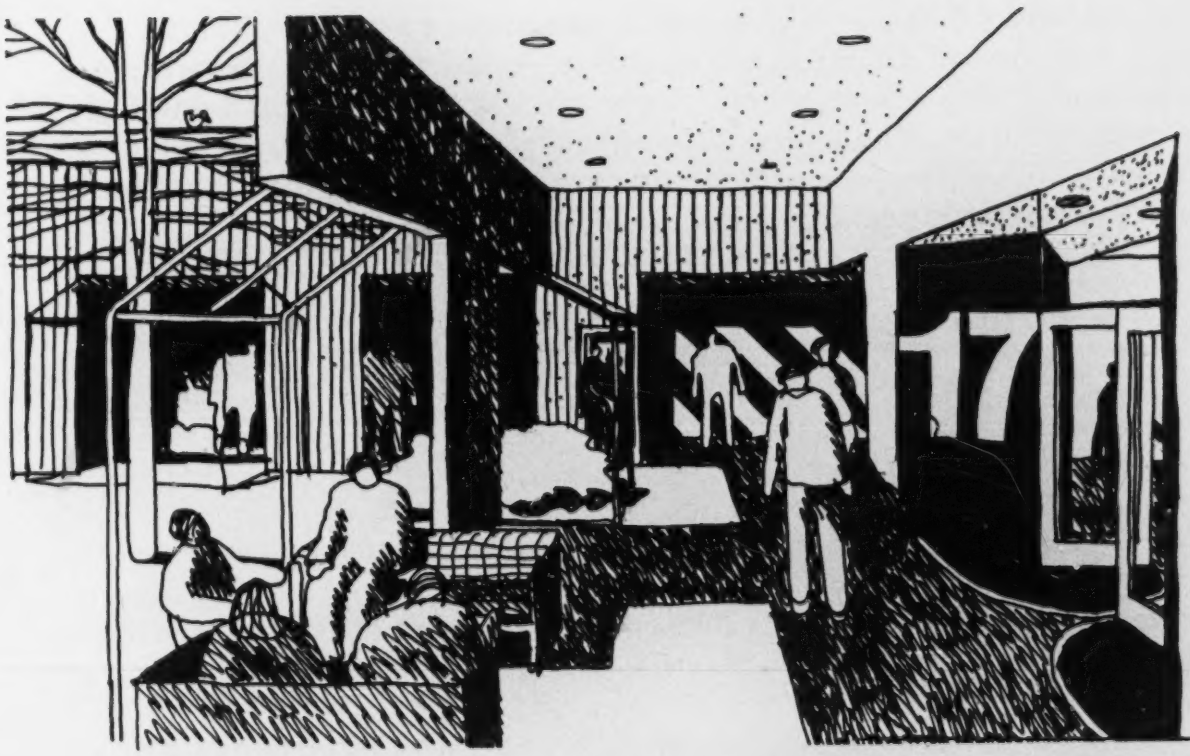
Drawing 2 is a means of dividing space by banners and paper divisions, like roller shades that can be pulled down or pushed up and transparent "things" that develop line as a means of defining space and yet allow light to come through: Shower curtains and old flags are items that can be used. This suggests that light defines space so that if you have an individual light for a group, say a reading area, that begins to define one space as separated from another. It suggests a floor surface change, like a small area rug will begin to define a space. It suggests that perhaps old furnishings, as well as new things, might be incorporated into the classroom situation so that a balance is developed rather than maintaining an absolutely new environment throughout the learning space. The furnishings then have a strong relationship with more domestic situations. Space can be defined quite literally and also by a change of surface. By going from hard to soft floor surface, an edge is formed which is a very minimal kind of space defintion. The banner and light fixture define a reading area in the drawing: Old, comfortable furniture, with its noninstitutional image, can be used too.

Wall surfaces can serve many purposes. They can double as display areas for student production or teacher directions. They can serve as writing surfaces (a chalkboard wall), as a mirror (possibly two-way) to provide an observation area adjacent to the classroom. Walls which are also display areas could simultaneously function as a sound barrier, depending of course on the material used.

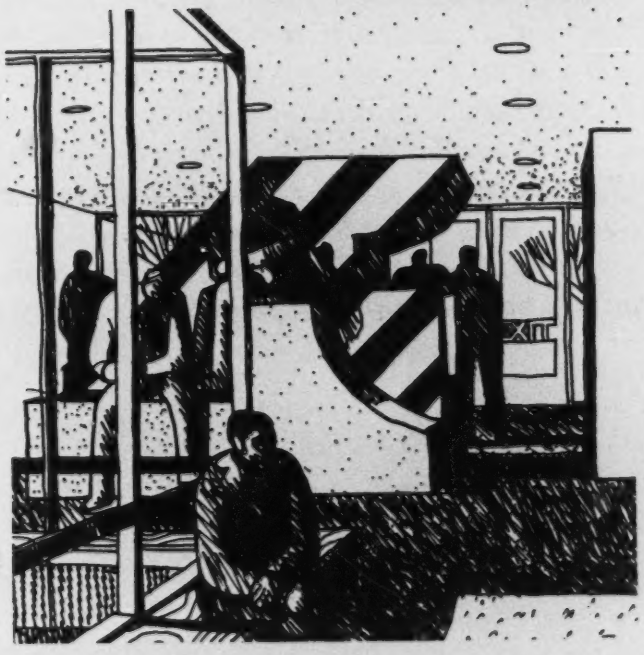
DRAWING 3

The concept of making multiple use of wall space extends beyond the classroom as well. Hallways are wallways—often the largest expanse of clear wall space within a school. These areas or surfaces lend themselves to display, but could also serve to provide directionality (visual or tactile cues) for both emergency and normal movement, and to provide contact with the exterior through the use of windows.

Drawing 3 illustrates a kind of fundamental principle that generates a lot of innovative ideas in classrooms. This is the use of surface and the continuity of surface. It is the idea that a wall ought to be utilitarian or functional—serve an educational purpose—in that there is no need for walls that are not used. Walls should have some kind of continuity from edge to edge and joint to joint. A whole wall, instead of having a chalkboard floating in the middle of it, would become the chalkboard itself or would become a tackboard in its own right so that the whole surface becomes usable. And the scale problem of smaller children and large adults using the surface wouldn't be a problem. The idea could be extended to include floor surfaces. Slate surfaces, for example, could be used on the floor as chalkboards. The drawing shows the chalkboard extending from wall to wall, from floor to ceiling, and being extended illusorily by a mirror situation. Behind that mirror might be an observation booth and the effect of the booth would not be quite so obvious.



DRAWING 4



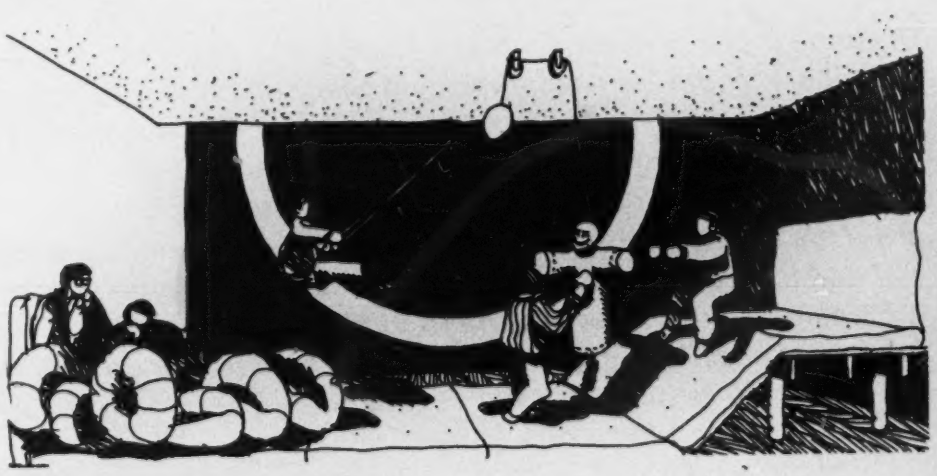
DRAWING 5

Drawing 4 relates to the idea of usable wall space extending out of the classroom—bringing educational experiences out into the corridor. This is something that children can investigate. In some fashion they will be able to interrelate with some of the concepts they are learning in the classroom situation. But basically this is a corridor that is sort of a street and there are events that take place here. It can be thought of as an educational market place. This is an "intense" location. It is a place where you arrive at goals. The corridor becomes more than just a space for circulation.

Drawing 5 is a corridor junction. It suggests that you identify one specific part of a corridor with another, and that begins to give you orientation in the building and planning of a complex circulation system. The circulation system should provide a reference wherever you are in that system . . .as to where you are going . . . where you have been . . . where things are. This allows some kind of interaction between the educational material and the physical dimensions. The relationship between physical dimensions and the environment ought to be established whenever and wherever possible so that surfaces can be used for sitting, for leaning, or anything. There ought to be a "sense of place" in several areas of a school in regard to such locations.

MAKING SPACE

Often, during the school day, everyone involved in the teaching-learning processes from teacher to specialists to students has the need for privacy. The teacher may have a need to withdraw from the class and pupils and vice versa. A teacher's space, with an adequate view of the class, yet with some degree of privacy, can contribute to more efficient teacher performance. Offices or other specialized facilities must be provided for the many support personnel who are involved in the education of exceptional children. Counselors who evaluate children's work skills, identify, counsel, and place children on jobs, require private space. Acoustically treated spaces with sufficient storage and access to electrical power are required for speech therapists. Large spaces must be provided for physical therapy. Stations for teacher aides should be located at strategic points in the building to permit quick accessibility to all areas where their services may be needed.



DRAWING 6

Additional small spaces have to be provided for resource and itinerant teachers who meet on a tutoring or small group basis with children in regular or special classes. While these teachers may be assigned to single schools, they also may be required to travel from school to school, thus requiring specific storage areas for both instructional materials and personal possessions.

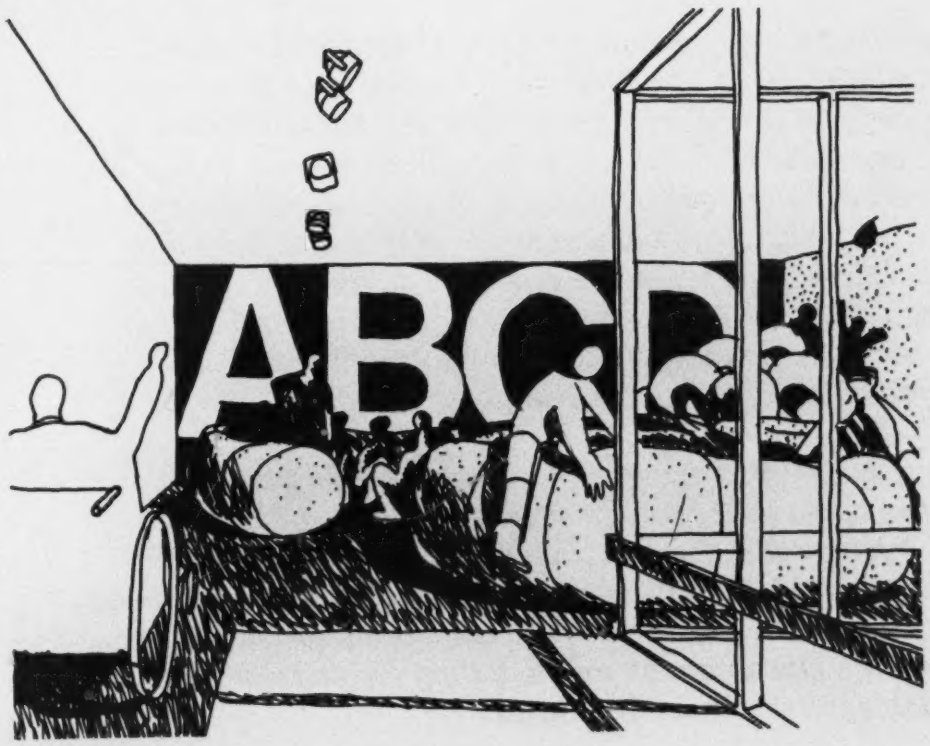
The involvement of a large number of staff is in itself demanding on a school facility. Adequate space for movement by the staff and children must be provided in corridors, on stairs, and throughout the building. Provision for the movement of vehicles at arrival and departure hours as well as sufficient parking space for staff and visitors is required. A reception and waiting area for children and parents must be carefully planned so that it is comfortable, non-threatening, inviting, and in some portion, child-scaled.

Drawing 6 is an architectural suggestion of space that could be used for the discharge of energy. This could be used by children who are hyperactive as well as for planned physical activities. If a student needs to relieve energy this room could provide a soft floor surface area. It would probably have a large space with devices in it that suggest action—the swing in this case. The space could have some kind of padding on the floor. A student could run up the wall. The steps are fairly large so that motor skills could be practiced. The swing could be used to work off excess energy as well. A punching bag could be put in there too. An alternative to the padded floor could be the use of inner tubes.

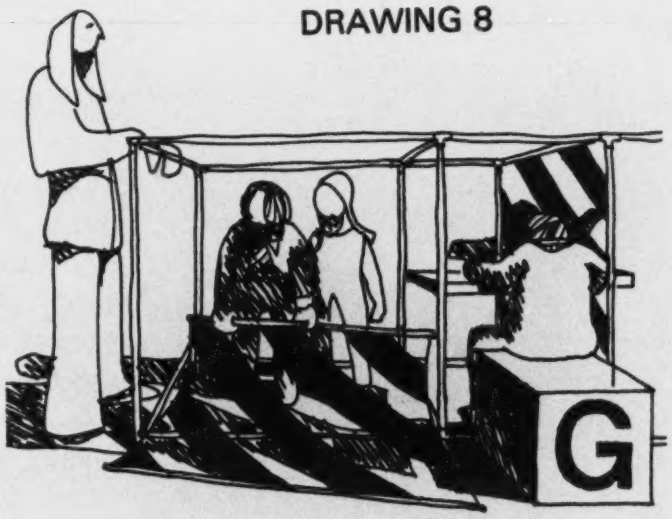
To make this space maximally effective, the swing, punching bag, or other hanging devices could be located in such a way as to allow room for other activities. Additionally, these devices could be mounted in a way to permit their removal from obstructing other activities. Other space, whether for calming down, resting, individual study, or motor activities, could be created within a classroom by manipulating furniture or by using equipment such as that shown in Drawing 7.

Many exceptional children will have a need to displace excess energy. This must be done without disturbing other children, the teaching process, or the teacher. Small rooms or "quiet areas" adjacent to a central work area is a suggested answer to this need. There must also be control for excessive yelling and screaming by children. An architectural solution to this problem would include rooms that mask or "dampen" noise, or the provision of withdrawal or isolation areas which allow behavior to be discharged.

DRAWING 7



DRAWING 8

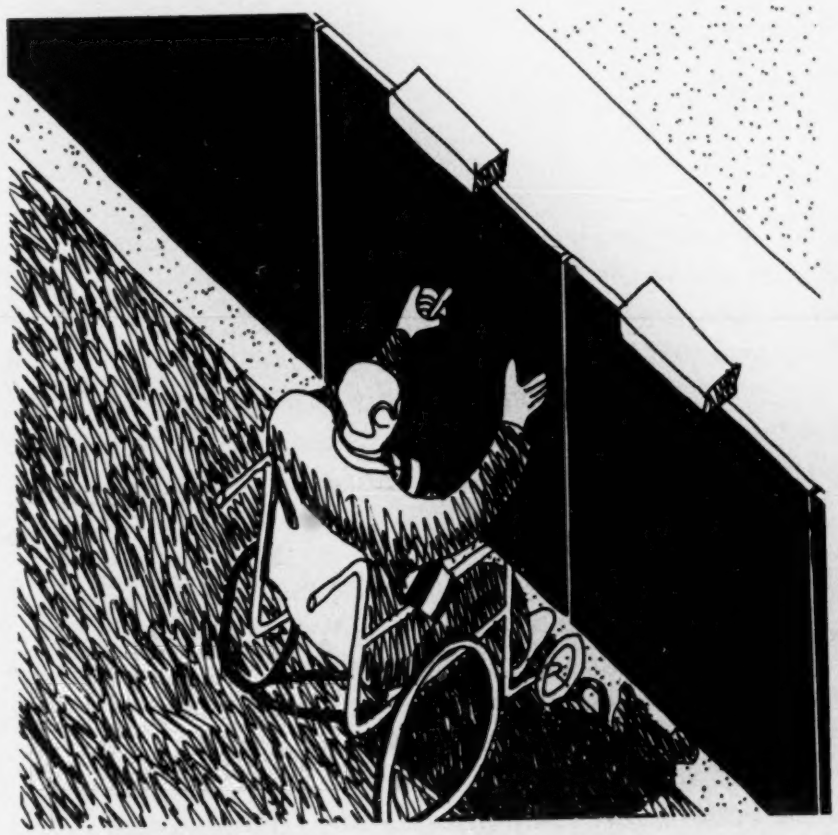


Most authorities in special education would agree that exceptional children need frequent individual instruction. Consequently, group classroom space must be convertible to individual space—either through carrels, adjacent rooms, or other subdivided areas. Another alternative was mentioned earlier regarding the use of the ceiling from which to hang material. (See Drawing 2.)

The inflatable "tubular worm" shown in Drawing 7 is an example of equipment that can be used to divide space for many educational activities. The "worm" also has recreational potential for free and controlled play. It was used for therapeutic purposes in Europe to encourage handicapped children to use their legs. An additional advantage of this kind of equipment is that it is collapsable for easy storage. It also represents a contrast —a soft kind of environment as opposed to the usual hard architectural environment.

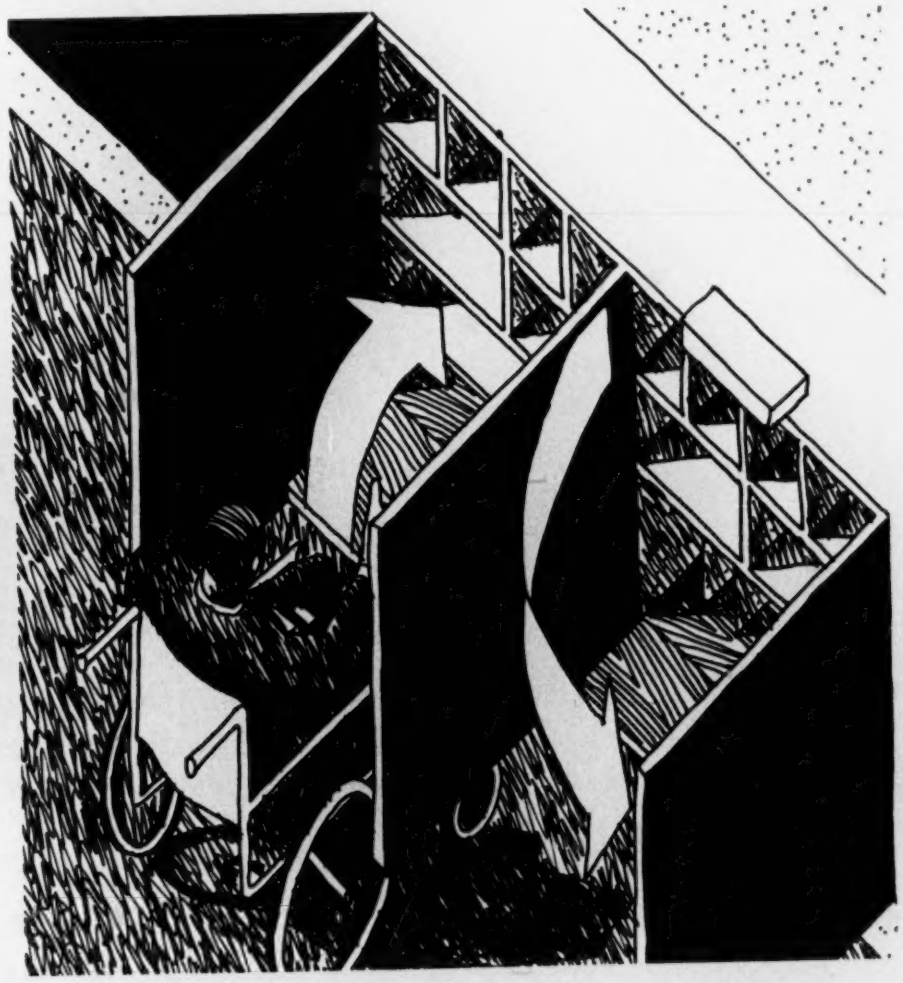
Drawing 8 is an example of an expanding-contracting area concept for an individual space of some kind. This is the idea of a tent. It will provide a collapsable, storable unit. One idea would be to have a transparent roof or no roof at all to permit illumination. All the surfaces could then be semi-transparent or transparent, with lines that could define the space. In this way, control could still be maintained and yet permit a sense of enclosure. Porous materials could allow circulation of air. This approach gives an illusionary sense of privacy rather than total privacy, so that the teacher can maintain control in the classroom.

Another consideration regarding changeability refers to a need by children for "sameness" or continuity—a need for having a routine. This suggests consistently allocating certain spaces in schools for certain functions. A reception area outside the learning space may serve to reassure the child that he is in the right place and knows what to expect when



DRAWING 9

DRAWING 10



he enters the classroom area. Furthermore, a corner of the room may be designated as a mathematics study area during a portion of the day, but could serve other functions with a change of lighting, wall location, and color. It is important though that each change occur the same way and at the same time. Change, too, has a routine.

Drawings 9 and 10 again refer to the "expanding and contracting" concept that can be used to create individual work stations or small group study areas. Drawing 9 shows a handicapped child working at a chalkboard and then in Drawing 10, it swings open into an individual cubicle.

The chalkboard light could also become the individual work light. This is a sort of system that flaps and folds and flops. This could be of wood construction with a particle board face painted with chalkboard paint. Or it could be a regular chalkboard. It could have a bulletin board on the rear face for individual display. Because it could be a personal storage unit as well, it can be more accurately labeled as a "child's office" rather than a cubicle. (Note that the chalkboard projects away from the wall to allow easy accessibility for the child in a wheelchair.)

DRAWING 11

DRAWING 12

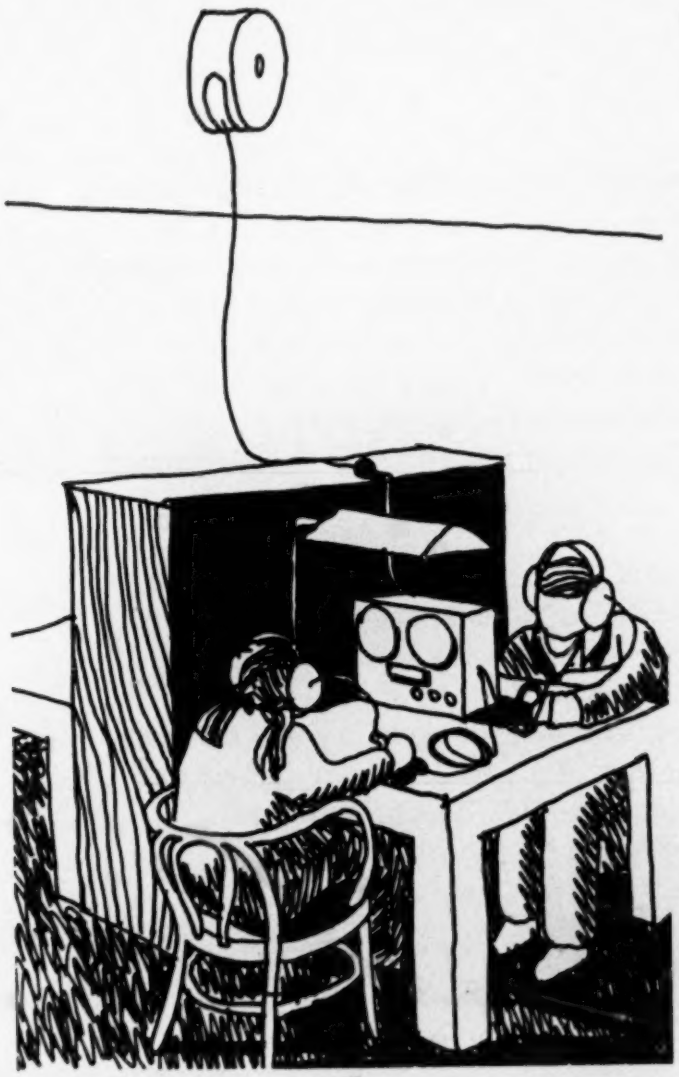
Drawing 11 illustrates a kind of relationship that might develop between the corridor and the inside of a classroom. Visual symbols, such as the room number, pictures of the teacher and the students, and visual access, clearly give a sense of location to the student. The ability to look into a classroom before entering might be beneficial to a handicapped child who has clearance problems with the doorway. These features could provide locality and identity to specific classrooms—expressing the content (what is happening within the classroom) and relating the classroom to the corridor.

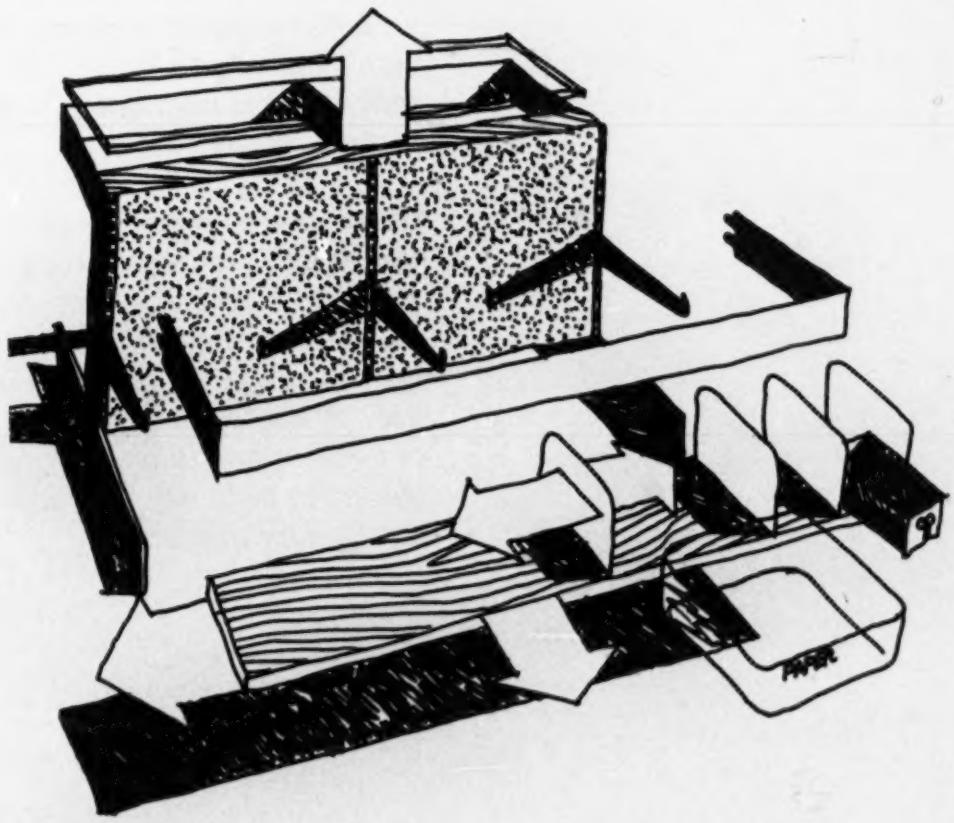
Other areas where there may be a special need for familiarity are the entranceways to the building. Drawing 12 illustrates a main entrance area. The use of an extra wide or "cinemascopic" view can provide an immediate relationship between interior and exterior. A stationary kiosk, providing a physical reference point for the beginning of the day's activities, can also serve to display information. Additionally, through the use of decoration which might include "supergraphic" design, tactual tracks, or light, the entrance area can begin to define circulation patterns throughout the building.

MAKING MORE SPACES—STORAGE

Storage space is always in demand. A basic problem is lack of storage space for classroom, art, and audiovisual materials. But a more funda-

DRAWING 13





DRAWING 14

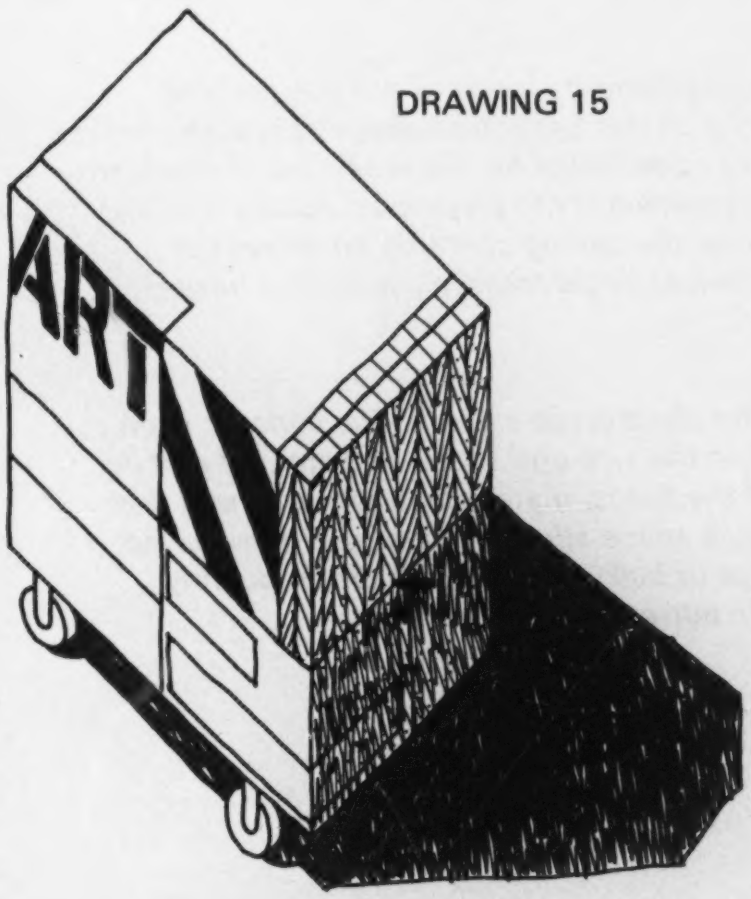
mental problem is what contribution this storage space can make to the educational program. Does it permit better teacher preparation to be the practice rather than the exception?

The use of a storage unit that complements a part of the educational program is shown in Drawing 13. In this case the storage space also serves to create a semi-private area. The possibility for the multi-use of any learning space is enhanced by easy accessibility to electricity. As shown here, a retractible device extended from the ceiling contains an extension cord. Use of a series of these devices could remove a potential hazard from within the classroom.

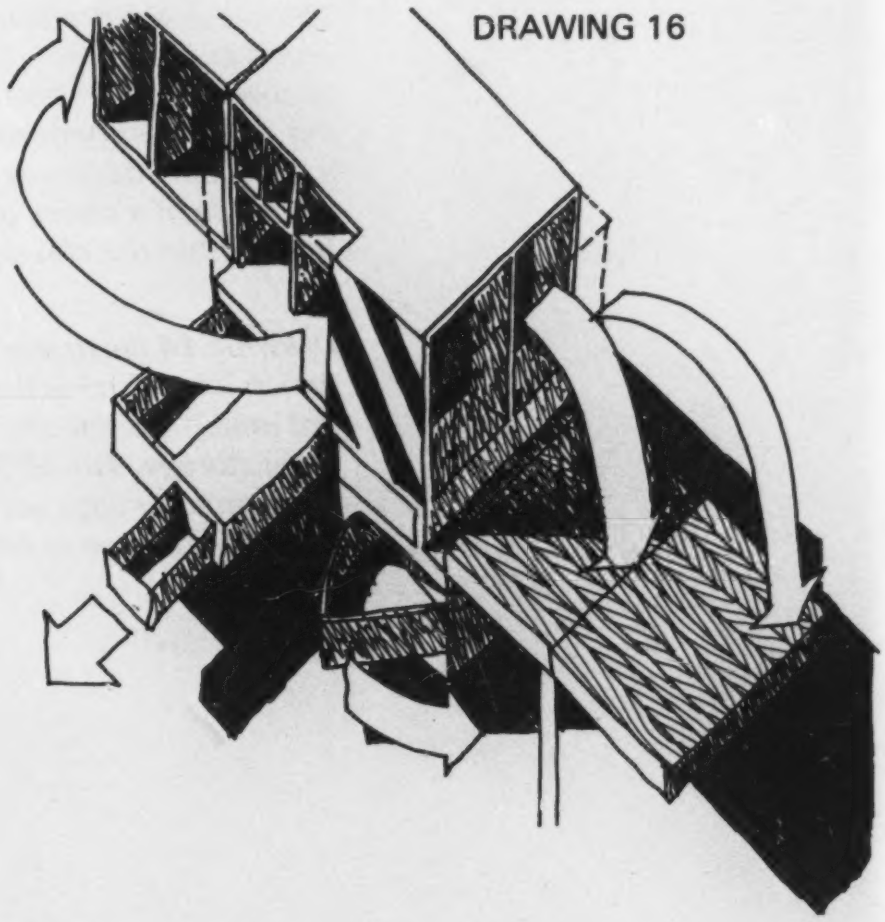
Drawing 14 illustrates a very flexible storage system. The concept upon which it is based is that too often the size and shape of a storage unit do not match the specifications of the items, materials, and equipment that need storage. The ability to adjust space allows greater use of materials by permitting easy access. Large or bulky items which are frequently used do not have to be stored in out-of-the-way locations.

Storage space must permit the teacher to store all needed items and yet have immediate access to them as they are needed by individual children. As children grow, they too should have access to the storage units. Other factors relating to the design of storage space include provision of centrally located space for infrequently used materials and equipment, space for large toys and equipment used frequently by the children, and space for storage of personal items belonging to the teacher and the children. Many movable storage units are now being designed in order to serve as space dividers to permit the modification of spaces.

DRAWING 15



DRAWING 16

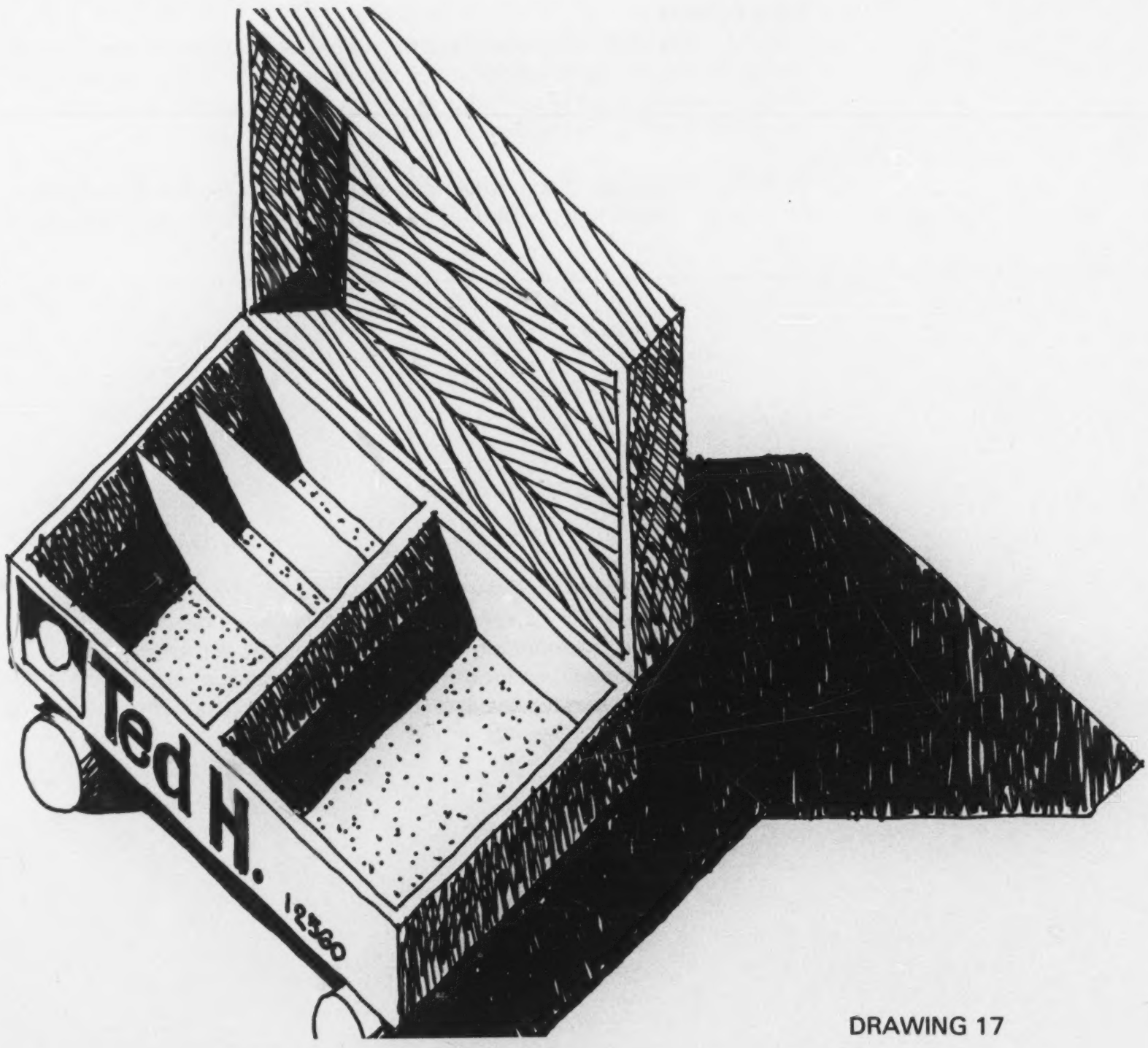


EQUIPMENT

Various types of electrical equipment relating to instruction, media, and research are among those things demanding space—either space to be stored or space to be used. Their use or projected use within a classroom has bearing on the design and planning process.

Specialized electronic apparatus is used for the instruction of exceptional children. These include machines that enable visually handicapped

In terms of work stations, Drawings 15 and 16 illustrate an example of a portable art station. By a set of unfolding flaps and drops, it could have potential for expanding and absorbing more space when it is needed. This can hold true for any number of classroom areas—be it a mobile library or mobile music instrument stand. It could be pulled into the room and begin to unfold.



DRAWING 17

Again, this idea is brought out in Drawing 17. This is a personal storage wagon that folds out like a tackle box and could display all of the kinds of personal items a student might need in a classroom situation. It could be stored in the corridor, or in the classroom.

children to listen to compressed speech; mechanisms which systematically dispense rewards to children participating in behavior modification programs; home-school telephones which enable homebound children to communicate with the teacher and the class; electrical devices which enable children with speech and hearing handicaps to monitor their speech; and sophisticated amplification and transmission equipment which assists hearing handicapped children to communicate with their teacher and with each other.

For the present, tape recorders, videotape machines, and closed circuit television all require electrical outlets, which in turn require cords. Because many handicapped children have mobility problems, the hazard of tangles of electrical cords must be avoided. Other surfaces, such as floors and ceilings, should be considered for the placement of outlets. (See Drawing 13.) Sufficient electrical cable should be located throughout the building. The expensive nature of this equipment will require that it be shared among many classes.

OBSERVATION

To gain a fuller understanding of a child's behavior and functioning, parents, teachers, and a variety of professional personnel may have a need for observation areas. The availability of these areas keeps interruption and subsequent artificial behavior at a minimum. Such systems may utilize closed circuit television or a small anteroom with one-way glass located immediately adjacent to the classroom area. In the latter situation it is essential that sound equipment be provided to enable the observer to hear what is occurring in the classroom. Observation systems may also be profitably used for research and for the pre-and inservice training of teachers.

The use of a child's classroom as an observation area provides a realistic setting so that the activities and behavior which are seen are authentic. Areas of observation could emerge from within the classroom itself. These areas could also be used at other times as study cubicles. Observation spaces could also be constructed by utilizing the classroom wall that is adjacent to the

corridor. The solution offered in Drawing 18 provides for the elimination of corridor traffic as a distraction.

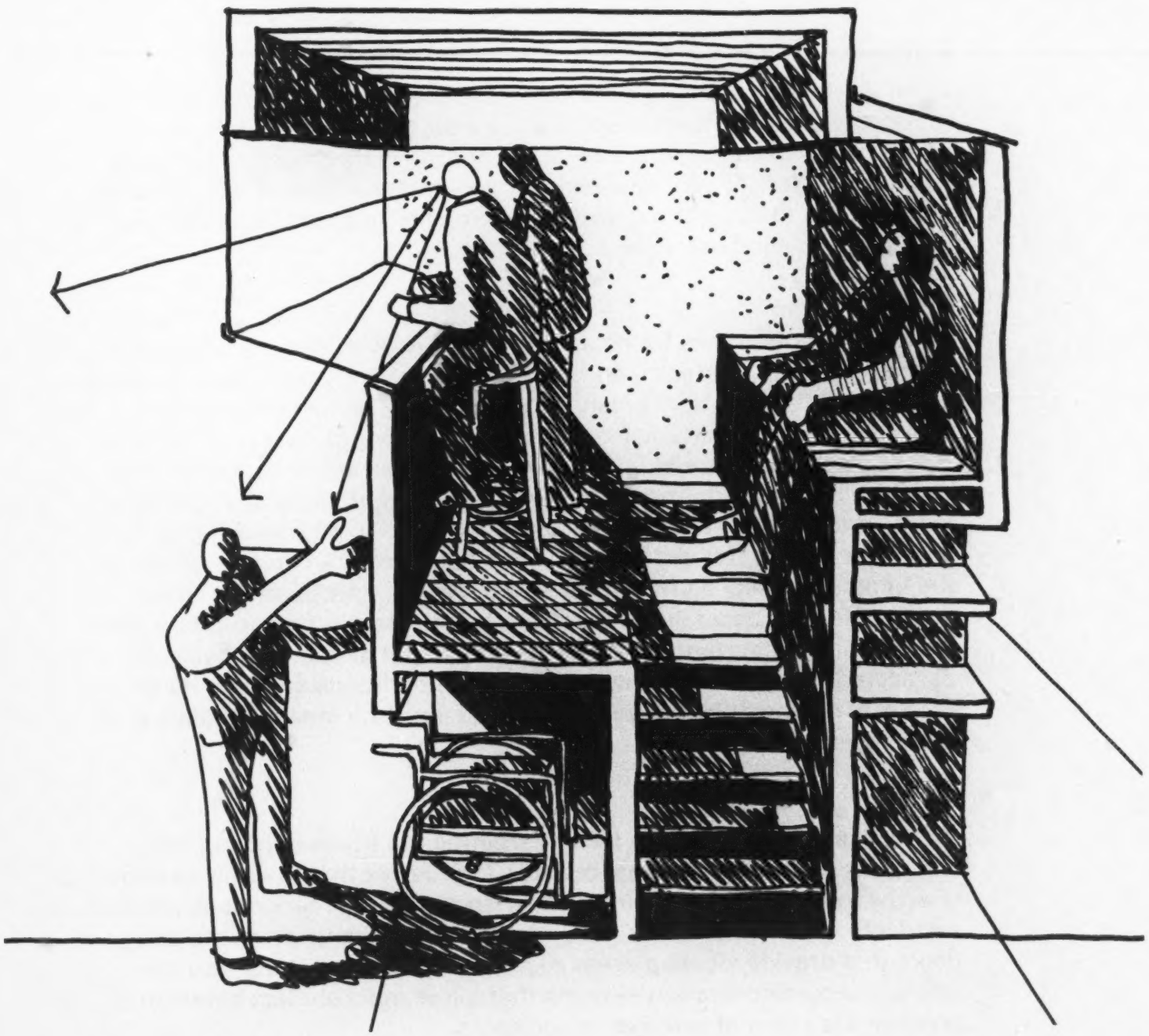
SAFETY

Careful attention must be directed to providing as danger free an environment as possible. This concept is, of course, true for all children but often requires special planning, equipment, and modification for handicapped children. There are a wide variety of modifications which can be made within the building to assist the children in functioning with as much mobility and safety as possible.

The use of safety glass for doors and low windows, and the elimination of sharp corners, surfaces, and projections may prevent serious injury to children who suffer from balance, coordination, or visual difficulties. Provision to insure escape from a building under emergency conditions must also receive careful attention. This involves easily operated emergency or exit doors, corridors free of barriers (improperly stored equipment), and warning signals that are meaningful to all handicapped children. Fire alarms, for example, must be equipped with audio signals for the blind and visual signals for the deaf. Appropriate auditory, visual, and tactile cues could direct handicapped children into appropriate pathways. This is important where large numbers of people are involved—particularly under emergency conditions when handicapped children, who often are unable to move with speed, must be moved rapidly out of the building.

Other safety considerations include treating the floors in potentially wet areas to prevent slipping, providing hardware that is easily manipulated by the children, and having arrangements and markings to prevent accidents in vehicular areas. Attention must also be given to the design of doors that provide viewing areas to prevent sudden opening into corridors and communication systems that allow rapid contact between areas in the event of seizures or accidents.

DRAWING 18



Drawing 18 is one example of an observation space. The notion here is to get the observer up above the level of the class. Depending upon the design, the unit can have several functions. It could provide storage space and, as in this design, it could contain a chalkboard. Then the observer can have a fairly clear view of the entire classroom area. This surface is usually lost to a one-way mirror. It could be located between the corridor and the classroom or between two classrooms. To minimize interruptions in observation rooms, a signal lamp could be located above the door to indicate that the room is in use.

DRAWING 19

Drawing 19 shows one way of creating a "path" within a school corridor. In the event of an emergency all striped floor surface areas lead to the outside. The diagonal stripes, or any type of design variation, could also be created to form a special tactile surface for blind children.

BARRIERS

Steps, curbs, narrow walkways, doors that are narrow or hard to open, toilet stalls that are too small, drinking fountains and light switches that are too high, and lack of accommodations for wheelchairs are but a few of the prevalent architectural barriers found in schools.

Concern for the prevention of barriers has inspired some thoughtful design in educational facilities for exceptional children. In schools where children use braces, crutches, or wheelchairs or have problems with coordination, modifications should begin at the entrance to the building where ramps are provided, curbs are eliminated, and special raised platforms allow for bus loading and unloading. Other modifications include: hardware on sinks and cabinets that can be used by all handicapped children; vertically adjustable chalkboards approximately 18-24 inches away from the wall to permit use by children in wheelchairs; and furniture that can be vertically or horizontally adjusted to meet the needs of children with a variety of handicaps.

Care must be given to insure that the elimination of barriers does not create an environment that is altogether radically different from what children will find in the home and community. As a student moves from elementary and secondary school, his environment should progress with his development—in other words, become less specialized. A school environment should, above all else, prepare students for independence; enabling them to make progressively more difficult decisions, to accept more responsibility for their own care.

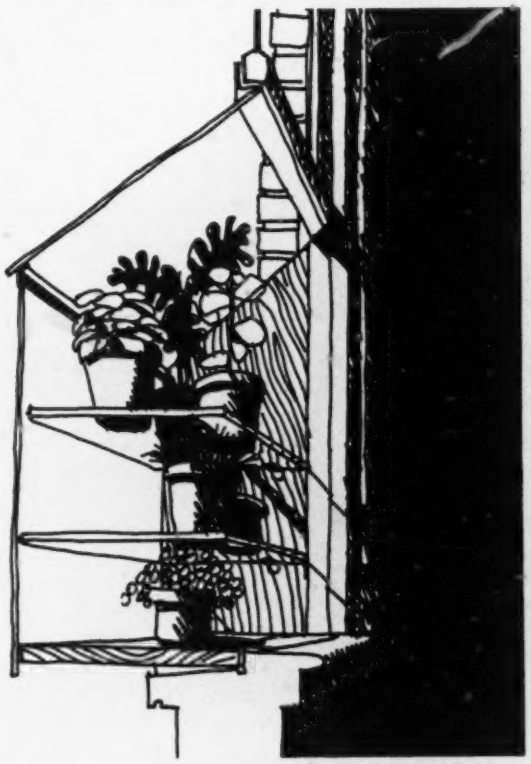
TOILETS

Toilet training is often a potential problem with many exceptional children. Therefore, the modification of toilet rooms has been frequently considered. Toilets and bathrooms must also meet the criteria of developmental progression. They should be adjustable in height and complexity of operation. Furthermore, there should be varying types of toilets to promote further progressive development.

THE EXTERIOR ENVIRONMENT

The physical environment outside of the area taken up by the school and its surrounding playfields and parking lots may also prove to be a learning resource for the children. All children have a need to experience aesthetic pleasure both tactually and visually. An outdoor garden with statuary and artistic objects may influence the development of aesthetic appreciation. In addition, windows which can be considered as extentions of indoor and outdoor environments can be designed to promote the aesthetic experience.

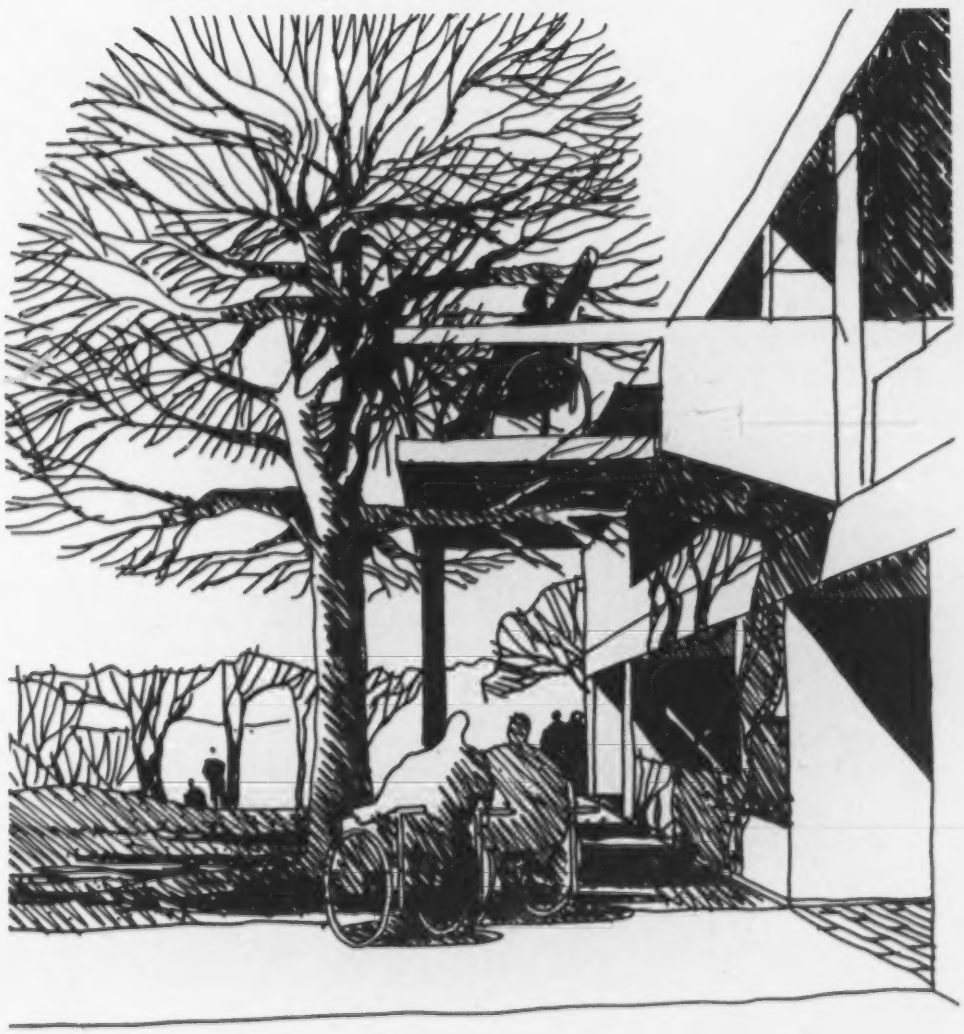
DRAWING 20



Drawing 20 is basically a mini-greenhouse. Projected beyond the exterior wall, it allows natural light to enter and permits visual access to the world outside of the classroom.

The effectiveness of the teaching-learning process is determined to a degree by the effectiveness of the physical environment. The physical structure must be responsive to the changing needs of the children and teacher as they learn. It must also provide for physical comfort and be satisfying as well.

DRAWING 21



Drawing 21 relates to the concept of giving handicapped children access to places they wouldn't normally be able to go. An example would be the tree house shown here. Whereas other children are able to climb to a tree house, some handicapped children are not. It could be developed through some kind of extension of a school building—an extension of an elevation such as a balcony or porch. It could come out of an existing building into a tree. This relates to a whole set of notions that could be developed in the landscape, or in a recreational space associated with the school. One way of creating this space would be to manipulate the ground plane.

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research

SELECTED FINDINGS

DESIGN METHODOLOGY

SELECTED RESEARCH: EFFECTS OF ENVIRONMENTAL MANIPULATION

CLIFFORD DREW *is Assistant Professor, University of Utah, Salt Lake City. This section is excerpted from a longer article by Dr. Drew which will appear in the December, 1971 (Volume 41, Number 5) issue of the* Review of Educational Research.

Although little research has been conducted to measure the effects of the physical environment on man, it is clear that such a relationship does exist. As an example, the phrase, "a romantic setting" automatically creates a clear image of what the environment is like in terms of furniture and lighting. Research that has been conducted focuses on two major areas: the physical effects of environment, and equally important, the psychological effects. The purpose of this section is to briefly explore some of the research available about both areas and to offer several methodological guides for assessing the effects of the physical environment on the education of handicapped children.

PHYSICAL EFFECTS

Change of environment and its subsequent effects on man are relatively easy to deal with. Man has, for some time, been aware that he could manipulate his physical environment to achieve physical results. It has further been known that the physical effects of alteration: were not difficult to conceptualize; could be achieved in many cases by applying force; and provided immediate visible and physiological results or rewards.

Because of the diversity of sources from which the following information is drawn, an exhaustive review is beyond the scope of this work. Only a few of the studies will be discussed here. The classification of some research in this area as physical rather than psychological is arbitrary. The sorting process is somewhat artificial. Some work appears to fit both categories—not surprising if physical behavior is psychologically motivated. This should not cause great concern since an integration of these bodies of information promises more potential for environmental change than presently exists.

Movement or locomotion in space is an area that has received perhaps more attention than any other aspect of physical behavior. Movement, as represented in this context, has been defined by Gibson (1958) as body motion that causes movement in the field of vision. Locomotion has further been viewed as being of two different types, distinguished on the basis of purpose. Bechtel (1967a) notes that *exploratory* locomotion generally pre-

dominates in areas where an individual is discovering or searching. Museums, art galleries, and other such spaces would seem to generate a relatively high frequency of exploratory locomotion. *Habitual* locomotion, on the other hand, is most often found in a frequently visited place such as an office or a home.

In a study of exploratory locomotion, Srivastava and Peel (1968) investigated the effects of color stimulation. They varied the color of a contrived art gallery and found that naive subjects in a dark brown room took more footsteps at a faster pace than subjects who were placed in a light beige room. Subjects in the brown gallery also covered nearly twice as much area in a less dense movement pattern and spent less time in the room than those in the beige gallery. The investigators reported a second experiment in which the subjects were aware that they were in an experiment. In this work the true nature of the investigation was camouflaged with information that another factor was under study. No differences in movement were obtained as a function of color. Results further indicated the color did not influence estimate of room size and that estimates did not relate to movement patterns.

Bechtel (1967b), in another study of exploratory locomotion, investigated the relation of movement patterns to stated preferences for art pieces. Movement within an experimental art gallery correlated significantly with preferred prints. Results of this investigation also indicated that knowledge of experiment suppressed subject movement which is in agreement with the findings of Srivastava and Peel (1968). In analyzing by sex, Bechtel noted that males tend to move more and cover more area, but have a slower pace because of additional pauses.

Proctor (1966) reported an investigation that focused on what can be considered an habitual environment. Frequency of subject interaction was recorded in three different nursing station designs within a mental hospital context. The designs differed in that contact and/or interaction occurred: (a) through a door; (b) via a glass-enclosed counter; and (c) through an open counter. Although substantially more patients entered the nursing station with the door, interactions occurred less frequently (an average

of one interaction per 15 minute observation) than either of the other two designs (average interactions per 15 minute observation—5.3 for the glass enclosed design, and 8.7 for the open counter). Proctor noted that the open counter design seemed to encourage social conversation while the door design resulted in item requests and permission interactions.

Srivastava and Good (1968) studied patterns of group interaction in a psychiatric treatment context. Three architecturally different environments were observed systematically over a 5 week period. These investigators obtained support for their two general hypotheses which related to the overall concept that design does influence behavior:

—Group interaction *will not* be significantly different in architecturally similar ward environments;
—Group interaction *will be* significantly different in architecturally different ward environments.

In addition to these hypotheses, Srivastava and Good focused on identification of some of the relationships between group interaction and specific environmental variables. Their results seem to indicate that public-private and active-passive space concepts are powerful variables in influencing group change. The data suggest that group interaction is rather static in private or passive spaces. In public or active spaces, however, interaction groups tend to change composition more often. Relative to the formation of interaction groups, Srivastava and Good's data suggest that this tends to occur near windows which visually connect the ward to the outside and also around low partitions 3 to 4 feet high. The authors note, however, that this latter grouping might also be influenced by seating arrangement.

Unplanned group interaction accounted for 97 percent of all group activity observed by Srivastava and Good. Small groups occurred most frequently in these unplanned interactions (55 to 76 percent); medium sized groups were second in frequency (22 to 37 percent); and large groups third (2 to 9 percent). The authors conclude that ward design complexity appears positively related to medium size group interaction.

Such physical differentiation of spaces seemed to influence the distribution of various group activities. Group interaction appeared to be more widely distributed under conditions of more obvious physical differentiation.

In a study with severely retarded children, Tizard (1968a) investigated the effects of stimulus variation and subject familiarity with the environment on the amount of locomotion. Pre-experimental observation indicated that two groups of subjects, clinically identified as average- and overly active, were significantly differentiated in amount of locomotion (Tizard, 1968b). Placement in a strange (exploratory) environment, however, reduced these differences to the chance level (Tizard, 1968a). Support was not obtained for the prediction that the overactive children would take longer to habituate to the experimental environment than the control children. Tizard notes, however, that nonsignificant trends in her data suggest that duration of the experiment (four sessions of 5 minutes) was not adequate to permit differences in rates of habituation to appear. The author further supports this possibility with a description of subject behavior where the overactive children were initially quieted by the new environment, but began to move more as the experiment progressed. The control group, on the other hand, tended to be more active initially and less active later.

"Toys-present" and "toys-absent" conditions were used to implement two levels of environmental stimulation. Both subject groups exhibited a significant reduction in exploratory locomotion under the toys-present as compared to the low stimulus condition. No difference, however, was noted as a function of subject classification. Tizard states that this investigation did not specifically study the theory that a low-stimulus environment subdues overactive children. Support for this hypothesis is not evident.

Research on behavior other than movement has been more sporadic. Black (1950) investigated the effects of room size and acoustic qualities on verbal behavior. Speaker rate and intensity were measured. Results indicated that both intensity and rate of vocalization were influenced by the experimental rooms. Subjects read more rapidly in small rooms than large rooms. Within the large rooms, subjects read at a more rapid rate in

acoustically "dead" rooms than "live" rooms. The acoustically "dead" rooms seemed also to generate a greater intensity in reading.

Color, as an aspect of the physical and psychological environment, has long been a factor influenced only by intuition. (Srivastava & Peel, 1968). Literature on the physical effects of color seems most often couched in physiological perception theory. Behavioral aspects of color relevant to this paper have, however, been studied to some degree. Birren (1965) cites evidence that indicates human reactions to be 12 percent faster than average under red lighting conditions. Green lights, on the other hand, seemed to generate reactions that were slower than normal. Colored lighting also seems to influence judgments of time, length, and weight. Goldstein (1942) observed that under red lighting these judgments tended to be overestimated while a green or blue light seemed to generate underestimates on these factors. Harmon's (1944) observations suggest that human responses to mental and visual tasks are facilitated by soft, deep colors in the environment.

Experimental modification of the physical environment has been extensively discussed as a powerful tool for facilitating institutional improvement (Cleland & Swartz, 1969). Kimbrell, Kidwell, and Hallum (1967) report substantial success in improving neuromuscular coordination, toileting, and feeding behaviors of severely and profoundly retarded girls through environmental adaptation. Modifications of playground and ward apparatus were specifically made to circumvent utility barriers with this population. Griffin, Mauritzen, and Kasmar (1969), in discussing psychiatric institutions, suggest that implementing changes of even a less drastic nature than those of Kimbrell (1967) may improve the therapeutic value of the environment. He suggests that furniture arrangements frequently may reflect convenience in housekeeping with little concern for social behavior (one of the primary aspects of diagnosis).

PSYCHOLOGICAL EFFECTS

This section explores some of the literature pertaining to the psychological influences of the physical environment on man. Some of the material reviewed in the previous "physical effects" section could perhaps be ap-

propriately discussed here. In these cases, as Parr (1964) suggests, psychological interests are often secondary to other primary concerns.

Tizard (1968b) reported that nonlocomotive activities of overactive and control retarded children were similarly frequent in the experimental environment. Self-stimulative behaviors such as rocking, head banging, and thumbsucking were second in frequency below locomotion under the stimulus-absent condition. In the stimulus-present environment, however, these behaviors accounted for a very low percentage of total activity (fifth out of five categories for overactive subjects and fourth for controls). A larger subject sample would have possibly shown this decrease to be statistically significant.

In an investigation with high school students, Karmel (1965) studied subjects being taught in classrooms with and without windows. Students attending the windowless classrooms drew schools with significantly more windows than students in schools having windows. In further analyzing the drawings he concluded that more unhappy children were in the group experiencing the windowless classroom environment.

The short term experimental results reported by Myers, Johnson, and Smith (1968) do not support Karmel's findings. The subject's exhibited no "unusual affective states" during a 7 day confinement in small, windowless cubicles when other sensory stimuli were not removed. Measures of happiness, fear, anger, depression, and arousal were taken.

In one experimental study, Kasmar, Griffin, and Mauritzen (1968) varied the visual aesthetics of a psychiatric environment. Subjects' mood, perceptions of a psychiatrist, and perceptions of the room were measured in a "beautiful" and an "ugly" room. Differences were not obtained in subject mood or ratings of the psychiatrist as a function of the two environments. Patients did, however, rate the environments differently.

Along a similar line, Mintz (1956) studied examiner performance as a function of prolonged testing in "beautiful" and "ugly" rooms. Results indicated

that subject examiners working in the ugly environment usually completed their testing in a shorter period of time than those in the beautiful environment. Concomitant to the less desirable physical surroundings were examiner reactions of room avoidance, fatigue, discomfort, monotony, and irritability. Subjects testing in the contrasting environment, on the other hand, expressed feelings of enjoyment, pleasure, comfort, and energy. Subject ratings of photographs also were significantly more positive in the beautiful as compared to the ugly rooms. The author notes that these differences persisted over a 3 week period, suggesting that the results were not an artifact of adaption to the environment.

Sommer and Ross (1958) and Sommer and Gilliland (1961) studied the behavioral influences of spatial arrangements. Sommer and Ross identified subjects on a geriatric ward who were behaviorally apathetic despite a "cheerful and bright" environment. By experimental arrangement of furniture to encourage interaction, these researchers were able to double the frequency of patient conversations. Sommer and Gilliland (1961) further support the influence of spatial arrangement in a study with mental patients. Their findings indicate that patients who tend to loiter in spaces that discourage interaction, as described by Osmond (1957), are primarily friendless. Those subjects who spend more time in spaces that encourage interaction have more friends.

As with any area of research which has yet to develop a repertoire of sophisticated methodology, much of the research reviewed here is fraught with weakness. It should be noted that the relationship between independent and dependent variables in environmental studies may well be interacting with unmeasured personality characteristics.

Several different sources of data contamination are evident. Results obtained by Srivastava and Peel (1968) and Bechtel (1967b) indicate that subject awareness of the research is a highly influential variable. This highlights the need for experiments using "unobtrusive measures" to avoid data confounding (Webb, Campbell, Schwartz, & Sechrest, 1966).

As noted above, the study of Srivastava and Peel (1968) resulted in a conclu-

sion that environmental color influenced the behavior of naive subjects but not that of subjects aware that an investigation was under way. This effect may not have been altogether due to subject experimental naivete. The naive subjects entered the experimental environment in groups while the others did so singly. This factor could have substantially influenced any or all of the locomotion measures. The two groups were thus systematically different in another dimension which might have, at least partially, produced the differences observed.

Srivastava and Good (1968) observed group interaction in a psychiatric residential environment. Although very meaningful, their observations could reflect established living patterns as much as design factors. Support for the plausibility of such a hypothesis is suggested by the findings of Smith, Downer, Lynch, and Winter (1969). This highlights an important potential data contaminator in environmental research. To be able to speak with certainty in terms of the influence of physical design, one must in some way partial out effects contributed by idiosyncratic living patterns. This would seem best done over a series of experimental sessions with different subjects. In this way, relatively consistent locomotion patterns might be assumed a function of the environmental design while between-group differences should account for error variance as a function of individual group eccentricities.

These are but a few examples of the methodological difficulties facing the physical environmental researcher. Should one aspire to a strict causality interpretation, direct implications may be tainted by learning. Evidence exists which hints strongly that many reactions to physical factors in the milieu may be learned. Carrier (1962), for example, reports data that highlight language as being influential in judgments made by hearing and deaf children about environmental variables. His results indicate that children with more language experience (older deaf and hearing children) made fewer correct judgments concerning color-weight dimensions than those with less experience (younger deaf children).

Despite the plausibility of environmental learning, it is reasonable to suspect that a person's knowledge about his surroundings will produce a range

of reactive tendencies from which prediction is possible. Based on this supposition, tentative implications may be drawn from even the limited research reviewed in this paper.

IMPLICATIONS

In terms of the two types of movement or locomotion described by Bechtel (1967a), *exploratory* movement has received greater attention than *habitual*. As he notes, this is probably a function of the less complex research logistics involved in studying exploratory movement. Bechtel emphasizes the need for more research on habitual locomotion since it accounts for the greater proportion of movement in the environment.

Using the need for varying types of movement-oriented behavior in education as a point of departure, the research seems to suggest several ways in which the physical environment can be manipulated to serve as a facilitator. Although the full range of parameters remain unexplored, color does seem influential in generating movement. If Srivastava and Peel's (1968) work is substantiated by further study, it could be that lighter colors foster greater and faster movement than darker colors.

Lightness or darkness of color may very well be an important environmental variable in school staff work and lounge areas. If the lounge is to be an active space perhaps a lighter color would facilitate such an objective. On the other hand, perhaps the lounge is to be an area for the reduction of activity and relaxation. In light of this objective a darker color may serve better. Also relevant to the environment of such a space are the findings in relation to differences in color such as red, blue, or green. The research reviewed in this paper seems to suggest that greens and blues tend to generate less pronounced responses than reds (Birren, 1965; Goldstein, 1942; Harmon, 1944).

Both the light-dark and hue dimensions of color may be found to be effective in space division. Activities in different areas within a classroom might be facilitated with different coloration depending on the educational program. Space in which more active instruction (and learning responses) are conducted could perhaps be more workable if colored in light reds. Areas

where more passive participation is desired may function better if colored in dark blues or greens. These aspects of color would seem equally relevant to play and recreation space.

It seems evident from Tizard's (1968b) work that the degree of environmental stimulation and its effects on "overactive" children needs considerably more research. Perhaps intuition has led us to believe that reduced stimuli would have a differential effect on such children when compared with others not exhibiting this behavior pattern. Tizard's results do indicate a substantial reduction in movement, but similarly for both groups. This would seem to suggest that stimuli can effectively be used to influence movement for different types of students. From this work, however, one might not suggest degree of stimulation as a special environmental therapy for overly active children.

Spatial arrangement and its influence on interaction has received considerable attention in the literature. Proctor's (1966) investigation offers definite guidelines for design of a monitoring station which may also serve as a place of transaction. If interpersonal interaction in such a place is desirable the evidence overwhelmingly favors an open counter design. On the other hand, if the area is merely for transactions and the desire is to minimize interaction, a rather closed design with a door-like entrance is preferable.

Manipulation of group composition and stability seems to be an intriguing possibility suggested by the findings of Srivastava and Good (1968). From their results it would seem that the educator-planner desiring a somewhat static group composition for interaction will include spaces that are rather private or passive in usage. The opposite effect seems to be generated by active, public spaces. Interaction occurring in these spaces tends to be a mobile phenomenon with group composition changing frequently. This may be useful both instructionally and for administrative purposes. If, for example, an administrator wished to design staff space to maximize a total "team" effort he might choose to maximize active-public space in the lounge area. His philosophy may, however, dictate a more fractionated whole with components being comprised of rather static smaller groups. In this case

his choice would most likely indicate a greater proportion of passive, private areas. This may be accomplished in several ways, one being physical differentiation. Furniture arrangements may be used effectively to manipulate space usage.

Although furniture arrangements are often *ex post facto* in terms of facility design they may be a relevant concern in the ongoing environmental manipulation. The extensive work of Sommer and his associates has indicated that this is an effective means of creating spatial organization which influences interaction. One direct instructional implication may be drawn in relation to the educator's affinity for arranging entire classes in a large circle for discussion. In most cases such an arrangement places 10 to 15 feet between any two opposing students. Research reviewed here indicates that when more than 5 feet exists between chairs in the opposing arrangement such seats are not preferred. This would seem to reduce substantially the effective communication facilitated by our "discussion circle." Students close to the 5 foot distance more closely approximate a side by side arrangement. Sommer's (1959) research seems to suggest that, since alongside seating is less productive of interaction than opposing, the discussion circle may be somewhat of an unfortunate arrangement for its intent.

The research reviewed in this section on the environmental factors of complexity and symmetry may have important practical implications. Translated into the instructional space in a school, it seems that for most students and staff, spatial and design configurations that are simple and symmetrical are preferrable. If, however, one were working with highly creative students a more complex-asymmetrical environment might be more productive. Since such an opposite environment on these dimensions is indicated for creative students as opposed to those average or below in this ability, the educator cannot design either on a permanent basis. This seems to suggest that the educator is going to have to work on an *ex post facto* basis. Changes in space and design configuration could perhaps achieve appropriate shifts in symmetry and complexity by utilizing temporary barriers, furniture arrangements, and temporary coloration.

Research on the affective domain has something to say concerning the general aesthetics of a room. In the studies reviewed here the ugly-beautiful continuum did seem to have an influence on subject's feelings about the room. It should be pointed out, however, that only in the extremes of the continuum did significant differences appear. Also, measures of productivity were not taken. For the general aesthetic environment in a school, it seems doubtful that sufficient variation on the ugly-beautiful dimension will occur to generate much affective variation.

Research reviewed on the thermal and crowding aspects of the environment is also of perhaps limited inferential value to education. Unless the thermal conditions and crowding reach an extreme, there seems to be little influence.

Implications drawn from this research have been limited. In some cases the relevance (or lack of it) was sufficiently evident so that further implications were not viewed as being warranted. The generation of implications from research is a risky undertaking but is necessary to promote application, other interpretation, and further research. Much of what appears in this section may be classified as speculation but is offered, hopefully, as a stimulation device for further work.

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SOME SUGGESTED MODELS FOR RESEARCH

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Editor's Note: The following material is adapted from an article which appeared in *Exceptional Children,* December, 1970

The issue of evaluative criteria, too often overlooked in research, is an element which cannot be ignored and must be built into the initial conceptualization of any design for educational facilities. The first task which must be faced is that of deciding which aspects of learning and social behavior should be expected to change as a function of a particular environmental design or modification. Both the educator and the architect should have some hypotheses before embarking upon the classroom design or introducing the environmental change. However, there is a frequent and understandable tendency to think about possible effects in global terms such as improving learning or increasing social adjustment.

These concerns must be reduced to more specific and measurable aspects of classroom behavior and performance if they are to serve as evaluative criteria in the scientific, experimental sense. Thus, one is forced to choose some specific aspect or aspects of a more general concern. Examples might include the choice of attending behavior as an index of performance in a group of hyperactive children or the use of completion of a series of lessons in a programed text as performance measures in a group of unmotivated children.

While these examples might be considered measures of learning participation—in the sense that both should be related to actual knowledge acquisition —actual acquisition of the usual academic skills might be made the criterion. The latter criterion is more or less traditional in the school setting and has an inherent appeal to the educator despite some limitations in measurement and specificity.

If social adjustment criteria are to be used, they too must be specified. One might hypothesize, for example, that controlling temperature and humidity might lessen instances of physical aggressions in acting out children, or that space arrangements might positively influence the amount of cooperative contact in withdrawn youngsters. But whatever the choice of evaluative criteria, some specificity must be introduced at this point in order that adequate measurement as a reliable index of change can occur.

MEASUREMENT TECHNIQUES

Once the variables to be used as evaluative criteria have been chosen, techniques must be defined for their measurement. A multitude of techniques may already be available, such as in the measurement of gross academic skills on the basis of standardized tests. On the other hand, the variable of crucial concern may not have a ready made measure waiting in the wings.

SIMPLE OBSERVATION. What should not be overlooked is the method of simple observation. Many educationally relevant variables, susceptible to change by environmental modification, are measurable by this technique. Such observations can result in an actual count of instances of behavior which then may be expressed as a ratio of the frequency of the behavior to the unit of time of observation for purposes of analysis. Both attending behavior and aggression can be successfully measured in this way. Certain performance criteria may be measured as an inherent element, as in the example of completion of the frames of a programed lesson.

It goes without saying that the researcher must satisfy himself that the measures he has chosen have the necessary attributes of reliability and validity. Measures with poor reliability are useless as indices of change while measures of dubious validity may leave one in the position of knowing that something may have changed but not knowing exactly what.

A word of caution. Too frequently, variables are chosen for research because there is a readily available technique for their measurement. The field of psychology has frequently been subject to flurries of research on certain topics simply because a new technique was developed for their measurement.

The purpose of a research design is to help answer the question of whether or not the environmental modification did in fact have an effect and to ascertain the degree to which the effect may be generalized to other children, teachers, and schools. A few appropriate designs are considered here.

THE CLASSICAL CONTROL GROUP DESIGN. This design involves the use of equivalent groups, one which receives treatment and one which does not.

All other factors which may influence the criteria are constant for both. The problems with meeting the assumptions of this design, held to assess the effect of environmental changes, may be insurmountable. It is unlikely that in the practical situation we can provide equivalent groups of exceptional children in experimental and control classes let alone assure ourselves of the equivalence of teachers and instructional methods. We may try to approach these ideals, but to the extent that we do not succeed, our results, either positive or negative, may be due to differences in extraneous factors rather than to the effects of our environmental variables.

THE USE OF QUASI-EXPERIMENTAL DESIGNS. When full control over either subjects, treatments, or other influencing variables is lacking, other less controlled designs may be used. These quasi-experimental designs can involve the use of only one group and may involve the use of repeated measures taken before, during, and after the treatment. A design of this type is the equivalent time-samples design where the treatment is introduced, measurement taken, treatment removed, measurement taken, treatment reintroduced, measurement taken, etc. In circumstances where the environmental modification could be easily introduced, withdrawn, and then reintroduced, this design could be used. Of course, the effect of the first introduction should not be a lasting one on the criterion measures employed or the effects of withdrawal and subsequent reintroduction would be obscured. Details of this design and suggestion for the statistical analysis of the data may be found in Campbell and Stanley.*

An additional quasi-experimental design which might be considered is the multiple time-series design. Criterion data are collected in a number of time periods both before and after the introduction of the environmental change in both the experimental group and a nonequivalent, but hopefully similar, control group. If the measures are easily obtained, but the environ-

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* Campbell, D.T., & Stanley, J.C. Experimental and quasi-experimental designs for research on teaching. In N.C. Gage (Ed.), *Handbook of research on teaching.* Chicago: Rand McNally, 1963.

mental modification not subject to easy removal and replacement, this design could substitute for the more rigorous equivalent control group method. However, even within this design, equivalence in other factors such as instructional method between the two groups must be approximated. Again, details are available in Campbell and Stanley.

CONTINGENCY REVERSAL DESIGN. Finally, one possible design is an adaptation of the single subject contingency-reversal design used in research in operant conditioning. In its original form the design involves: (a) determining the frequency of the desired behavior in the natural setting; (b) introducing a reinforcing stimulus following this behavior which is hypothesized to increase its frequency; (c) determining the frequency of the behavior under these conditions; (d) changing conditions so that the same reinforcing stimulus is made contingent upon some response incompatible with the desired behavior; (e) again measuring frequency; (f) reintroducing the condition wherein the reinforcer is made contingent upon the desired behavior; and (g) remeasuring frequency under this condition.

The logic of this design is that the treatment (contingent reinforcer) produces the effect since it can be shown to increase and decrease the frequency of the criterion behavior below its natural level. Obviously, the use of the single case does not permit generalization to other subjects with much confidence, but generalization may not be at issue.

An analogue of this design for evaluating the effect of environmental modification is suggested for use in a situation where two environmental modifications, theoretically expected to produce opposite effects, can be introduced one after the other. For example, if one theorized that a certain temperature-humidity range would increase attention whereas another range would increase motor activity (a behavior incompatible with attention), this design could provide a test of this hypothesis. This method permits one to reject with considerable certainty the alternative hypothesis that the changes in attending were due to factors other than the environmental changes. However, generalization to other children, teachers, and schools is uncertain. Of course, it may be adequate to demonstrate an effect with one class before being concerned with problems of generality.

This discussion is presented as a stimulus to the further examination of a significant problem. Each of the factors stressed herein requires further thought and exploration. Each could be put to the test of a formal research project. The issue as a whole is sufficiently important in all dimensions so that it should become a major concern of research oriented persons and agencies.